Transcript of Yan Yao, Ph.D.

Date: August 8, 2024
Case: Samsung Electronics Co., LTD -v- RJ Technology, LLC (PTAB)

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WORLDWIDE COURT REPORTING & LITIGATION TECHNOLOGY

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IPR2023-01183
APPLE 1041
Apple v. RJ Technology
IPR2023-01350

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UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE PATENT TRIAL AND APPEAL BOARD

SAMSUNG ELECTRONICS CO., LTD.,
Petitioner
V.
RJ TECHNOLOGY LLC,
Patent Owner.

Case IPR2023-01183
Patent No. 7,749,641

VIDEOTAPED DEPOSITION OF
YAN YAO, PHD
THURSDAY, AUGUST 8, 2024
9:49 A.M. CT

JOB NO.: 548258
PAGES: 1 - 282
REPORTED BY: Mark Tod Kislingbury, CSR RDR CRR

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DEPOSITION OF YAN YAO, PHD

ORAL AND VIDEOTAPED DEPOSITION OF YAN YAO, PHD, produced as a witness at the instance of the Petitioner, and duly sworn, was taken in the above-styled and numbered cause on August 8, 2024, from 9:49 a.m. to 7:10 p.m., before Mark Tod Kislingbury, Texas CSR No. 2298, Certified Realtime Reporter, Registered Diplomate Reporter, at the offices of Greenberg Traurig, LLP, 1000 Louisiana Street, Suite 6700, Houston, Texas, pursuant to Notice.

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A P P E A R A N C E S

ON BEHALF OF THE PETITIONER:

JEFFREY COLIN, ESQUIRE
GREENBERG TRAURIG, LLP
ONE VANDERBILT AVENUE
NEW YORK, NEW YORK 10017
212-801-6494

ON BEHALF OF THE PATENT OWNER:

GEORGE STAMATOPOULOS
KOBRE & KIM
800 THIRD AVENUE
NEW YORK, NEW YORK 10022
646-658-4972

-AND-

ROBERT ZHOU, ESQUIRE (VIA ZOOM)
KOBRE & KIM
HKRI CENTRE ONE, HKRI TAIKOO HUI
288 SHIMEN YI ROAD, 43RD FLOOR
SHANGHAI, 200041
PEOPLE'S REPUBLIC OF CHINA (PRC)
86 21 3210 2174

ALSO PRESENT:

ZACH THETFORD, VIDEOGRAPHER

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P R O C E E D I N G S

THE VIDEOGRAPHER: Here begins Media Number 1 in the videotaped deposition of Dr. Yan Yao in the matter of Samsung Electronics Company, LTD vs. RG -- RJ Technology, LLC, in the United States Patent and Trademark Office. Case number is IPR2023-01183.

Today's date is August 8th, 2024. The time on the video monitor is 9:49 a.m. Central time. The video -- videographer today is Zach Thetford representing Planet Depos. This video deposition is taking place at 1000 Louisiana Street, Suite 6700.

Would counsel please voice identify themselves and state whom they represent.

MR. COLIN: Jeff Colin from Greenberg Traurig on behalf of petitioner Samsung Electronics Co., Limited.

MR. STAMATOPOULOS: George Stamatopoulos with Kobre & Kim representing patent owner RJ Technology. And with me connecting remotely is my colleague Robert Zhou.

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THE VIDEOGRAPHER: All right. Our court reporter today is Mark Kislingbury representing Planet Depos. Would our reporter please swear in the witness.

YAN YAO, PHD

of lawful age, being first duly sworn, deposes and says in reply to the questions propounded as follows:

EXAMINATION

BY MR. COLIN:

Q. Good morning, Dr. Yao.

A. Good morning.

Q. Have you ever been deposed before?

A. No.

Q. Okay. So just to explain what's going to happen today, I'm going to ask you a series of questions, and I'm going to do my best to ask clear questions. If you answer my question, I'm going to assume that you understood it. Okay?

A. Yes.

Q. So if anything's unclear, just ask me, and I'll try to rephrase it.

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A. Sure.

Q. Okay. And because the court reporter here is typing out everything you -- you say, you have to speak rather than just nod your head.

A. Yes.

Q. And please wait until I complete my question before you begin to answer. Okay?

A. Sure.

Q. And that will, again, help the court reporter.

Is there any reason why you can't give me your best testimony today?

A. No.

Q. Okay. I'm going to try to take a break about once an hour. If you need a break, just let me know, and we'll try to go into a break shortly unless there's a question pending. Okay?

A. Yes.

Q. You understand that you're under oath today; right?

A. Yes.

Q. What did you do to prepare for today's

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deposition?
A. To prepare for the -- today's deposition, I reviewed my deposi- -- declaration and the exhibits in the case and also had a discussion with the counsel to prepare for the deposition.
Q. Okay. When did you have discussion with counsel?
A. Probably in the last month.
Q. Can you be more specific than that?
A. Yeah. Yeah, the -- you know, since is my first time deposition, some -- we had meetings on Zoom with counsels maybe twice a week in the last three weeks.
Q. Okay. So you may have met with counsel about five or six times over the last three weeks?
A. That's correct.
Q. Okay. When you met with counsel, how long did you meet with counsel?
A. Roughly one -- one to two hours each time.
Q. Okay. And which counsel did you meet with?

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A. So I have met with George, with Robert, and with -- yeah -- other counsels. So mainly the two.
Q. Okay.
A. Yeah.
Q. And you signed a declaration in this IPR proceeding; right?
A. I believe so.
Q. Okay. And you understand IPR, I'm referring to Inter Partes Review; correct?
A. Yes.
Q. Okay. And your declaration of Dr. Yan Yao is already in front of you. It's marked Exhibit 2006; correct?
A. Yes, that's correct.
Q. And on page 111 of your declaration, that's your signature; right?
A. Yes.
Q. You understand that you signed this declaration under the penalty of perjury; correct?
A. Yes.
Q. Do you believe that the contents of your

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declaration are accurate?
A. Yes.
Q. Okay. Are you aware of any mistakes in your declaration?
A. No.
Q. You are also RJ Technology's expert in connection with the RJ Technology vs. Apple litigation in the Central District of California; correct?
A. That's correct.
Q. Okay if I call that "the Apple litigation"?
A. Hm-hm.
Q. Okay. Have you performed any work for RJ Technology besides work in this inter parte review proceeding and the Apple litigation?
A. No.
Q. Okay. Have you been involved with any of the litigation in China with Apple?
A. No.
Q. Okay. You submitted two claim construction declarations in the Apple litigation;

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correct?
A. Two -- Can you repeat the question?
Q. Right. You submitted two claim construction declarations in the Apple litigation; correct?
A. I remember one, but I remember -- no, I don't remember the second one.
Q. Okay.
MR. COLIN: And so let's mark for the record -- this is already marked as Exhibit 2022.
(Exhibit 2022 marked)
Q. (BY MR. COLIN) This is your June 23rd, 2023, declaration for the Apple litigation; correct?
A. Yes.
Q. And that's your signature on page 25 of it?
A. That's correct.
Q. And you signed it under the penalty of perjury?
A. That's correct.

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Q. Are you aware of any mistakes in this declaration?
A. No.
Q. And you believe this declaration is accurate? And by "this declaration," I mean your Exhibit 2022.
A. Yes.
MR. COLIN: Let's mark as a new exhibit the 1036, your declaration dated July 14th, 2013.
(Exhibit 1036 marked)
THE WITNESS: Thank you.
Q. (BY MR. COLIN) And does this refresh your recollection that you also submitted a second declaration in the Apple litigation on July 14th, 2023?
A. Yes.
Q. And that's your signature on page 12?
A. That's correct.
Q. Okay. And you signed that declaration under the penalty of perjury; correct?
A. Yes.

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Q. Are you aware of any mistakes in your July 14th, 2023, declaration?
A. No.
Q. Okay. And you believe your July 14th, 2023, declaration is accurate?
A. Yes.
Q. Dr. Yao, you agree with me that lithium ion batteries can be charged by several different charging algorithms; correct?
A. Yes.
Q. And you agree that constant current charging can be used to implement the charge cut-off voltage; correct?
A. Can you repeat?
Q. You agree with me that the constant current charging can be used to implement the charge cut-off voltage of the claims; correct?
MR. STAMATOPOULOS: Object to form.
A. Typically we use a constant current and a constant voltage to reach the equilibrium of the batteries when it reaches a fully charged state.

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So when you use a current -- constant current, you can do so at a very slow rate. For example, take 20 hours or 50 hours to charge, then at the end of charge you can reach equivalent state that would considered fully charged.
Q. Dr. Yao, you did not answer my question. Do you agree with me that constant current charging can be used to implement the charge cut-off voltage; correct?
MR. STAMATOPOULOS: Same objection.
A. As I mentioned, depends. If you charge very slowly, take 50 hours, hundred hours to charge, you could reach the potentially charge cut-off voltage. But you do it at relative medium rate or faster rate, you are not able to reach the charge cut-off voltage.
Q. So, Dr. Yao, it's your testimony today that you don't know -- well, let me strike that.
It's your testimony today that constant current can be used to implement the charge cut-off voltage depending on the specific

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conditions used? Is that accurate?
MR. STAMATOPOULOS: Objection.
A. Can you point to my declaration where I render my opinion on this?
Q. (BY MR. COLIN) You provided opinions on claim construction in this case; correct? You have three claim construction declarations in front of you; right?
A. I have two, yes, claim construction conclusion in front of me.
Q. You don't have opinions on claim construction in your IPR declaration? You have a whole section on claim construction; right?
A. Right.
Q. All right. So in three different places you provide opinions on claim construction concerning charge cut-off voltage; correct?
A. Yes.
Q. When you use constant current, constant volting charging, you agree with me that constant current charging is applied until the battery reaches its charge cut-off voltage; correct?

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MR. STAMATOPOULOS: Object to form.

A. Can you repeat the question?

Q. (BY MR. COLIN) Sure. When you use constant current, constant volting charging, you agree with me that constant current charging is applied until the battery reaches its charge cut-off voltage; correct?

MR. STAMATOPOULOS: Same objection.

MR. COLIN: And just for the court reporter, it's "cut-off," o-f-f.

A. So in my declaration, in Exhibit 2022, paragraph 32, I basically saying that -- so "the battery is charged under a constant current until it reaches a maximum configured voltage, at the which point it's charged at that voltage until charge is complete. The constant current stage allows the battery to be fully quickly -- to be charged quickly and efficiently. During the constant voltage stage, the battery is slowly charged to its full capacity, and this constant

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voltage state prevents the battery from being overcharged, charging to a level higher than the charge cut-off voltage."

Q. Okay. So to be clear, Dr. Yao, in Exhibit 2022, at paragraph 32, you indicate that when you're using constant current, constant voltage charging, constant current charging is applied until the battery reaches a maximum configured voltage at which point it is charged at that voltage until charging is complete; correct?

A. Yes.

Q. And that's what you told the court?

A. Yes.

Q. Okay. So you state constant current is applied until the battery reaches a maximum configured voltage; right?

A. Yes.

Q. You didn't tell the court that when the battery is fully charged, it meets the charge cut-off voltage; correct?

MR. STAMATOPOULOS: Object to form.

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A. What's your question?

Q. (BY MR. COLIN) You didn't tell the court that when the battery is fully charged, that's when it meets the charge cut-off voltage; correct?

MR. STAMATOPOULOS: Same objection.

A. Well, I would assume it's the same thing. The charge cut-off voltage, the maximum voltage the battery is configured to charge essentially has the same meaning.

Q. (BY MR. COLIN) Well, in paragraph 32 you say constant current voltage is applied until the battery reaches a maximum configured voltage; right?

A. Yes.

Q. Okay. And in paragraph 33 of Exhibit 22 -- 2022, about -- starting at line 18, you indicate, "For example, in many laboratory settings batteries, are charged at a constant current without a constant chronically voltage state. Once the battery reaches a predetermined voltage" -- and then in parentheses, "i.e., the

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charge cut-off voltage" -- "the charging stops"; correct?

A. That's what -- that's what it says here.

Q. Right. So you told the court in your declaration that with constant current charging, the battery is charged until a predetermined voltage, i.e., the charge cut-off voltage, and then it stops; correct?

A. The charge stops, yes.

Q. So you agree with me that constant current charging involves charging the battery at a constant current until it reaches the charge cut-off voltage; correct?

MR. STAMATOPOULOS: Object to form.

A. Yes.

Q. (BY MR. COLIN) And you rely on the court's claim construction order in your declaration; correct?

A. Yes.

Q. You believe the court's claim construction order is accurate?

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A. Yes.
MR. STAMATOPOULOS: Objection. The --
MR. COLIN: He already answered the question.
MR. STAMATOPOULOS: Well, my objection is still on the record, but you haven't shown him the order.
MR. COLIN: Okay. Now a speaking objection which is improper. Again, it was after he already spoke.
I'd like to introduce what's already premarked as Exhibit 2010 the order regarding claim construction from the Apple litigation.
Q. (BY MR. COLIN) And this is the court's marked order that you rely on in your IPR declaration; correct?
A. Yes.
Q. If you turn to page 9 of 32. I'll just indicate to you the page is marked on the bottom right-hand corner, for ease of reference.

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A. Hm-hm.
Q. It's an IPR policy. Are you there, page 9?
A. Yes.
Q. Okay. So about five lines from the top, the court's order indicates the CC algorithm -- and CC is constant current; right?
A. Hm-hm.
Q. Okay. So "the constant current algorithm describes a method in which the battery is charged at a constant current until it reaches the charge cut-off voltage." Do you see that?
A. Yes.
Q. Do you agree with the court's statement?
A. Yes.
Q. But in this IPR proceeding, you opine to the board that constant current charging does not charge the battery until it reaches the charge cut-off voltage; correct?
MR. STAMATOPOULOS: Objection.
A. Can you point to the location where I say it in my declaration?

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Q. (BY MR. COLIN) I'm asking you, Dr. Yao. It's your opinion in this IPR proceeding, you tell the board that constant current charging does not charge the battery until it reaches the charge cut-off voltage; correct?
MR. STAMATOPOULOS: Same objection.
Q. (BY MR. COLIN) I'm not sure what you're looking for, but it might be in paragraphs 117 to 119.
A. 117?
Q. Possibly. Again, I'm just trying to --
A. Okay.
Q. -- help you. I think that might be what you're looking for. Or I'll just rephrase the question. Those paragraphs might help you.
I'm asking you, Dr. Yao, it's your opinion in this IPR proceeding, you tell the board that constant current charging does not charge the beater until it reaches the charge cut-off voltage; correct?
MR. STAMATOPOULOS: Object to

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form.
A. So in my declaration, paragraph 92, here I state, "Charge cut-off voltage is the maximum voltage to which the battery is configured to be charged." It's a battery property. So that's the definition for charge cut-off voltage here. So the battery is in equilibrium state.
And also in paragraph 86 I state, "When a battery is being charged, there are two distinct voltage, potentials, the applied voltage and the battery voltage, and their relationship, expressed by the following equation." The equation, you can see it on paragraph 86.
V applies apply voltage and U is the battery voltage equilibrium.
So in the case of constant current, depending on what current you use, at end of charging, this battery may or may not reach the battery voltage equilibrium; therefore, it may not reach the cut-off voltage, as defined here in the declaration.
Q. (BY MR. COLIN) So let me see if I

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understand that. In your opinion you're telling the board that constant current charging sometimes will reach the charge cut-off voltage and sometimes will not reach the charge cut-off voltage, depending on conditions?

MR. STAMATOPOULOS: Object to form.

A. I'm telling the board under current condition sometimes it reach equilibrium if you charge at pretty slow rate. Some -- you know, if you charge at the higher rate or medium rate, it will not reach the equilibrium at the end of the charge.

Q. (BY MR. COLIN) Dr. Yao, you told the district court that constant current voltage is applied until the charge cut-off voltage is reached; right? We looked at your declaration, Exhibit 2022, paragraph 33, which has that very language. You're telling me, you're telling the board something else? Is that accurate?

MR. STAMATOPOULOS: Object to form.

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A. What I'm telling the court is consistent with what I've written in the declaration.

Q. (BY MR. COLIN) Where in your report do you talk about equilibrium in -- sorry. Let me start...

So going to paragraph 33 of your declaration, Exhibit 2022 -- this is your declaration to the court -- you told the court, "batteries are charged at a constant current without a constant voltage stage. Once the battery reaches a predetermined voltage -- i.e., the charge cut-off voltage -- the charging stops."

That's what you told the court; right?

A. Hm-hm.

MR. STAMATOPOULOS: Object to -- Dr. Yao, I'll just ask you to take a second to allow me to lodge the objection so that we don't have the issue of talking past each other. Object to the form.

A. Can you repeat the question?

Q. (BY MR. COLIN) Sure. You told the court in Exhibit 2022 that when you're applying constant

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current, it's applied until the battery reaches a predetermined voltage -- i.e., the charge cut-off voltage -- then the charging stops. Correct?

MR. STAMATOPOULOS: Same objection.

A. So this statement in the Apple claim construction, at that -- I think at that -- within this case, both parties assumed this reach -- the battery would reach equilibrium state.

And also, second, this completely inconsistent with my declaration because at that time the focus mainly on the different algorithm or charging. There's no matter of dispute, varied voltage or applied voltage.

So in here, this is at equilibrium that once the battery reaches equilibrium state, charge cut-off voltage is the same as the maximum voltage, predetermined voltage.

Q. (BY MR. COLIN) Dr. Yao, you did not answer my question. You told the court when you're applying constant current charging, it's applied until the battery reaches a predetermined

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voltage -- i.e., the charge cut-off voltage -- then the charging stops. Correct? That's what you told the court? Those words are in your declaration.

MR. STAMATOPOULOS: Object to the form.

A. I think I already answered your question.

Q. (BY MR. COLIN) You haven't answered my question. Are you refusing to answer my question, Dr. Yao?

MR. STAMATOPOULOS: Object to form.

A. This is what you just said. Once the battery reach the predetermined voltage, the charge cut-off voltage, the charging stops. That's what I have in the claim construction.

Q. (BY MR. COLIN) Correct.

A. That's correct.

Q. You didn't tell the court sometimes constant current voltage is applied to reach the charge cut-off voltage and sometimes, depending on the conditions, it doesn't reach the charge

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cut-off voltage; right? You didn't tell that to the court?

MR. STAMATOPOULOS: Object to form.

A. As I have stated, this is not a dispute of matter during the Apple claim construction. The focus at that time is on all presents of charging -- constant voltage charging, constant current charging, constant current, constant voltage charging.

Although I do not specifically say, but I think both parties understand that the charging stops once the battery -- both parties -- both parties understand that this referring to the equilibrium state of the charging.

Q. (BY MR. COLIN) Equilibrium state is nowhere in your declaration. It's nowhere in the court's claim construction, either; correct?

MR. STAMATOPOULOS: Object to form.

A. Yeah. General matter is, you know, didn't have that in the claim construction.

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Q. (BY MR. COLIN) Well, you told the court you could reach the maximum voltage to which the battery is configured to be charged using constant current voltage; right?

Sorry. Let me rephrase that.

Looking at paragraph 33, you told the court in the last sentence -- well, let me say this.

You could use constant voltage charging; correct?

A. Yes.

MR. STAMATOPOULOS: Object to form.

Q. (BY MR. COLIN) And constant voltage charging, in your opinion, you told the court, could be used until you reached the charge cut-off voltage?

MR. STAMATOPOULOS: Object to form.

A. Cut-off voltage could.

Q. And constant current --

A. Not always.

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Q. -- constant voltage also could be used to achieve the charge cut-off voltage; correct? That's what you told the court in paragraph 33?

MR. STAMATOPOULOS: Object to the form.

A. Constant current can also reach charge cut-off voltage if do you it slowly. It could. Depends on what current you use.

Q. (BY MR. COLIN) The patent doesn't describe any current to use, correct, the '641 patent?

MR. STAMATOPOULOS: Objection.

A. I don't understand the question.

Q. (BY MR. COLIN) I said the '641 patent doesn't describe any particular current to use for charging, discharging; correct?

MR. STAMATOPOULOS: Objection.

A. Can I have the '641 patent?

Q. (BY MR. COLIN) Sure. And I'm not trying to trick you. I don't think it's in there. So you can look, but I'm not aware of anywhere where it could be. I will provide it to you. It will

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be Exhibit 1001. Yeah, this is already premarked as Exhibit 1001. It's US Patent Number 7,749,641.

And my question was, the '641 patent doesn't describe any particular current to use for charging or discharging; correct?

MR. STAMATOPOULOS: Object to form.

A. The '641 patent didn't specify which charging algorithm is used.

Q. (BY MR. COLIN) Right. It also doesn't -- the '641 patent is also not specifying a charging algorithm; it doesn't provide any information on the charge or discharge rates. Correct?

A. I think so.

Q. The file history of the '641 patent also doesn't mention any particular charging algorithm; correct?

A. I didn't really carefully review the patent history; so I didn't really know.

Q. Okay. And you provide no opinions on the prosecution history of the '641 patent in your

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declaration; correct?
A. No, I didn't provide my opinion on that.
Q. Okay. And you provided no opinion on the prosecution history of the child application of the '641 patent in your declaration; correct?
A. No, I didn't.
Q. So it's your opinion, what you're telling the board, is that -- let me back up.
When you say "applied voltage" in your IPR declaration, are you also using that interchangeably with "charging voltage"?
MR. STAMATOPOULOS: Object to form.
A. Yeah, I -- they're similar. That was the most time I use "applied voltage" in my declaration.
Q. (BY MR. COLIN) Is there any difference between charging voltage and applied voltage?
MR. STAMATOPOULOS: Object to form.
A. Applied voltage mainly internal -- indicates internal applied. But charging voltage

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sometimes depends on context. Could have some -- it's not very accurate. Could have, you know, some -- it's very vague, I would say, meaning.
Q. (BY MR. COLIN) I didn't hear that last thing you said. Can you just repeat that?
A. So applied voltage is -- it emphasize internal applied voltage. The charge voltage is also, you know, mainly to emphasize the external applied voltage.
Q. Right. So you don't indicate any difference in your declaration between applied voltage and charging voltage. You use these interchangeably; correct?
MR. STAMATOPOULOS: Object to form.
A. I don't really remember where I used the charge voltage. Can you -- in the declaration. Can you point me to the location where I use "charge voltage"?
Q. (BY MR. COLIN) Let me ask you this. Is it your opinion that "charge cut-off voltage" is synonymously used with "charging voltage"?

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MR. STAMATOPOULOS: Object to form.
A. Again, I want -- can you help me, point out to the location where I use the "charge voltage"?
Q. (BY MR. COLIN) Dr. Yao, I'm asking you for your opinion. I'm not asking about the declaration. If you want to look to anywhere in your declaration, you can look.
A. Yeah.
Q. My question is, is "charge cut-off voltage" synonymously used with "charging voltage"?
MR. STAMATOPOULOS: Object to form.
A. In my declaration I have carefully considered all these concepts; and, you know, I have written my opinion in the declaration. So it would be helpful to me if you can tell me where -- which part you're referring to.
Q. (BY MR. COLIN) So sitting here today with your declaration's in front of you, you can't

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answer my question of whether "charge cut-off voltage" is synonymously used with "charging voltage"?
MR. STAMATOPOULOS: Objection. Form.
A. Can you repeat?
Q. (BY MR. COLIN) I'm just trying to get your opinion. Is it your opinion that charge cut-off voltage and charging voltage are two different things or they're the same thing? I'm asking your opinion on charge cut-off voltage. So I'll ask it one more time.
Is it your opinion that "charge cut-off voltage" is synonymously used with "charging voltage"?
MR. STAMATOPOULOS: Object to form.
A. Charge cut-off voltage is a varied property. It's different from applied voltage, which is similar applied. But charging voltage, could you define what the charging voltage, in context?

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Q. (BY MR. COLIN) You're the expert in this proceeding, Dr. Yao. Can you define for me "charging voltage" in the context of the '641 patent?

MR. STAMATOPOULOS: Object to form and the scope.

A. Okay. I will review my declaration carefully.

Q. (BY MR. COLIN) Maybe I could try to help you a little bit, Dr. Yao. How about you turn to Exhibit 2022, which is your Apple IP -- your Apple claim construction declaration, paragraph 18.

Okay. So paragraph 18, Exhibit 2022, you say, "As the '641 patent describes, increasing the charging voltage applied to a lithium battery can increase its capacity." Do you see that?

A. Yes.

Q. Okay. So it's your opinion, you told the court that the '641 patent describes increasing the charging voltage applied to a battery; correct?

A. Yes. Here the -- this is charging

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voltage applied to battery is essentially applied voltage I have in the IPR. So, as I mentioned, this anode battery property is different from the charge cut-off voltage.

Q. Okay. So your opinion in this paragraph 18, what you're saying here, that the '641 patent describes increasing the charging voltage applied to a battery, that's an applied voltage, and that's different than a charge cut-off voltage; correct?

MR. STAMATOPOULOS: Object to form.

A. Yes.

MR. COLIN: I'd like to mark as Exhibit 1037; so this will be a new exhibit.

(Exhibit 1036 marked)

Q. (BY MR. COLIN) So this exhibit has a comparison of paragraph 18 of Exhibit 2022, which you were just looking at, and your IPR declaration, Exhibit 2006, at paragraph 49. And I highlighted the difference -- I added highlighting to note the difference between the two paragraphs.

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Okay?

And, as we just discussed a minute ago in paragraph 18 of Exhibit 2022, you use the term "charging voltage applied" when discussing what the '641 patent teaches; right?

MR. STAMATOPOULOS: Object to form.

A. You're not -- are you asking a question?

Q. (BY MR. COLIN) Yeah. My question is, in paragraph 18 of Exhibit 2022, you used the term "charging voltage applied to a battery" when discussing what the '641 patent describes; correct?

A. Yes.

Q. Okay. And in your IPR declaration, Exhibit 2006 at paragraph 49, you copy this same paragraph from your other declaration. Right? Except for the fact that you replaced "charging voltage applied" with "charge cut-off voltage"; right?

MR. STAMATOPOULOS: Object to form.

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A. Yes.

Q. (BY MR. COLIN) Okay. So when you told the board this is what the patent describes, you told the board something different than what you told the court?

MR. STAMATOPOULOS: Object to form.

A. I see in both cases they are fully consistent.

Q. (BY MR. COLIN) Okay. So you're saying charging voltage applied to a battery is consistent with the charge cut-off voltage of a battery?

MR. STAMATOPOULOS: Object to form.

A. The charging voltage applied to a battery the same value as charge cut-off voltage when the battery reach equilibrium state.

Q. (BY MR. COLIN) There's nothing in your declaration to the court saying "when the battery reaches equilibrium state"; correct? That's a new opinion in your IPR declaration?

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A. Well, at that time, you know, as in Apple, as I mentioned, between Apple and, you know, claim construction, there's no dispute on the applied voltage or battery voltage. And this -- both sentence, both paragraphs are completely wrong -- completely correct. We are not saying there has to be the same -- we have to give the same term in both descriptions.

Q. Okay. So you're using "charging voltage applied" and "charge cut-off voltage" consistently in these two paragraphs; they mean the same thing?

MR. STAMATOPOULOS: Object to form.

A. They are not -- in the -- they are different. Charge applied voltage, internal applied voltage is not a battery property.

Q. (BY MR. COLIN) Okay. So the --

A. Internal voltage is the battery property. So they could have same value. They could have different value. Depends on the condition. So -- but both paragraphs are correct.

Q. (BY MR. COLIN) Okay. So the '641 patent

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describes increasing the charging voltage applied to increase the capacity; correct?

MR. STAMATOPOULOS: Object to form.

A. Yes, increase the charging voltage, apply to battery can increase its capacity.

Q. (BY MR. COLIN) Why did you change "charging voltage applied" in your court declaration to "charge cut-off voltage" in your IPR declaration?

MR. STAMATOPOULOS: Object to form.

A. I think if I explain the reason, in the claim construction is focused on the charging algorithms. But in the IPR, the focus of dispute is on the definition of the charge cut-off voltage. I think that's why, to answer the -- you know, to be more -- to -- in the IPR, I would like to use this term "charge cut-off voltage." That's slight difference, but -- but in the IPR case, it's more related to the dispute of the matter.

Q. (BY MR. COLIN) So you're not applying

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the claim construction for charge cut-off voltage from the district court in the IPR because there's a different dispute?

MR. STAMATOPOULOS: Object to form.

A. The declaration, the IPR is fully consistent with the claim construction to the court.

Q. (BY MR. COLIN) Okay. Claims 1 and claims 5 use "charge cut-off voltage" and "charge voltage" interchangeably; correct?

MR. STAMATOPOULOS: Object to form.

Q. (BY MR. COLIN) Let me rephrase. Claim 1 and Claim 5 of the '641 patent use "charge cut-off voltage" and "charge voltage" interchangeably; correct?

MR. STAMATOPOULOS: Same objection.

A. I'm going to see "charge cut-off voltage" in Claim 5. I didn't see "charge voltage."

Q. (BY MR. COLIN) So in Claim 1, the last

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limitation reads, "Ratio as calculated by a specific capacity with a charge voltage limited to 4.2 volts." Do you see that?

A. Hm-hm. Yes.

Q. And Claim 5 in that same limitation at the end, the capacity ratio limitation, refers to a theoretic capacity with a charge cut-off voltage set at 4.2 volts; right?

A. I think that Claim 1 should be a specific capacity with a charge cut-off voltage limited to 4.2 volt. That should be the charge cut-off voltage same, too, 4.2 volt.

Q. You don't opine anywhere in your declaration that "charge voltage" in Claim 1 has any different meaning than "charge cut-off voltage" of Claim 5; right?

A. Can you --

Q. Right. You don't opine anywhere in your declaration that "charge voltage" in Claim 1 has any different meaning than "charge cut-off voltage" of Claim 5; correct?

MR. STAMATOPOULOS: Object to

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form.
A. I think in my IPR I do say the charge -- the applied voltage is different from the charge cut-off voltage. And if it's -- you know, the charging voltage defined here is applied voltage, then would be different from charge cut-off voltage.
Q. (BY MR. COLIN) So that's not my question, Dr. Yao. My question is, you don't opine anywhere in your declaration that "charge voltage" in Claim 1 has any different meaning than "charge cut-off voltage" of Claim 5; correct?
MR. STAMATOPOULOS: Object to form.
A. I don't think I used "charge voltage" in my declaration. The declaration.
Q. (BY MR. COLIN) Right. You don't address the language "charge voltage" of Claim 1 anywhere. And I'm just stating that for the record. I mean --
MR. STAMATOPOULOS: Object to form.

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Q. (BY MR. COLIN) So, I mean, my question is just simply, you don't opine anywhere in your declaration that "charge voltage" in Claim 1 has any different meaning that "charge cut-off voltage" in Claim 5; correct?
MR. STAMATOPOULOS: Same objection.
A. Seems like you ask me to form opinion as I sit here today? I don't know -- I'm not prepared to form opinion on this.
Q. (BY MR. COLIN) I'm not asking you to form an opinion. I'm asking, you provide no opinions, which you seem to be -- we seem to be saying the same thing.
A. Hm-hm.
Q. And I'm not trying to trick you here. You just don't provide any opinions in your declaration concerning the difference in claim language between Claim 1 and Claim 5 with "charge voltage" and "charge cut-off voltage"; correct?
MR. STAMATOPOULOS: Object to form.

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A. I think to answer your question for the first time, I'm saying this should be understood, that Claim 1 and "charge voltage" should be understood as a "charge cut-off voltage."
Q. So you think Claim 1 and Claim 5 are using that phrase, "charge voltage" and "charge cut-off voltage" in the same way?
A. Yeah. Different charge voltage or explain to you, "charge voltage" is different from "charge cut-off voltage." In this, you know, Claim 1, I think this "charge voltage" should be changed to "charge cut-off voltage."
Q. You don't provide that opinion in your declaration; correct?
A. I don't think I'm asked to --
Q. Well, you told the IPR board in paragraph 60 that Claim 5 is representative of Claim 1; correct?
A. Can you say again?
Q. Yeah. You told the IPR board in paragraph 60 of your declaration that Claim 5 is representative of Claim 1; correct?

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A. Yes. In paragraph 60 I do state, "The patent includes two independent claims, 1 and 5, of which Claim 5 is representative."
Q. Claim 5 indicates that the charge cut-off voltage is set value; correct?
MR. STAMATOPOULOS: Object to form.
MR. COLIN: Let me rephrase.
Q. (BY MR. COLIN) Claim 5 of the '641 patent indicates that the charge cut-off voltage set at 4.2 volts; correct?
A. Yes.
Q. Okay. So Claim 5 indicates that the charge cut-off voltage is a set value; correct?
MR. STAMATOPOULOS: Object to form.
A. No.
Q. (BY MR. COLIN) So you're saying the language, the "charge cut-off voltage set at 4.2 volts" doesn't indicate that the charge cut-off voltage is a set factor?
A. Charge cut-off voltage is a measured

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property. When internal applied voltage is used to charge a battery, the battery will be charged, set of charge will increase until reaches equilibrium. At that point charge cut-off voltage has same value as the set value of the 4.2 volt -- 4.2 volt. They have same value but doesn't mean they are same -- have same definition.

Q. (BY MR. COLIN) Well, it's your opinion that charge cut-off voltage is a measured value; you actually have to measure the battery voltage to see it. Correct?

A. Yes.

Q. Okay. And you don't provide any opinions in your declaration on the fact that Claim 5 indicates that there's a charge cut-off voltage set at 4.2 volts; correct?

MR. STAMATOPOULOS: Object to form.

A. I don't really understand your question.

Q. (BY MR. COLIN) My question is, you don't provide any opinions in your declaration concerning the fact that the claim language

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indicates that the charge cut-off voltage set at 4.2 volts; correct?

MR. STAMATOPOULOS: Object to form.

A. I do form an opinion in my declaration on page 20, paragraph 51 and 52. Here -- I put here, I put in the declaration, I said, "The charge cut-off voltage is a critical design parameter for lithium battery. I explain the difference between the charge cut-off voltage of a battery -- a constructed term in this and other relevant proceedings -- and applied voltage during charging in later parts of my declaration. But note the difference here to avoid confusion, as these concepts are different, though related, since both are relevant to charging. At the time of the '641 patent, it was conventional to limit the charge cut-off voltage to 4.2 volt or lower.

"For example, lithium cobalt oxide has been a well-studied cathode material in lithium batteries primarily due to its high energy density and stable electrochemical performance.

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Traditionally, the charge cut-off voltage for lithium cobalt oxide has been limited to 4.2 volt. It was understood that the voltage higher than 4.2 volts, lithium cobalt oxide can undergo irreversible structural change and oxygen loss, which not only degrades the material's capacity and cycling stability, but also pose risks of thermal runaway and battery failure."

So that's my opinion related to the Claim 5.

Q. (BY MR. COLIN) Dr. Yao, that didn't answer my question at all. My question is simply, you don't provide any opinions in your declaration concerning the claim language that indicates the charge cut-off voltage is set at 4.2 volts; correct?

MR. STAMATOPOULOS: Object to form.

A. I think I answered your question. Maybe you be explain to me why you think it's not -- I didn't answer your question.

Q. (BY MR. COLIN) Dr. Yao, those paragraphs

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you just read verbatim into the report -- into the record here don't cite a single thing in the '641 patent or any other support; correct? It's just your statements?

A. Yeah, that's my opinion of this.

Q. So my question -- and I'm not trying to trick you, again. I don't see it in your declaration. My question is simply, you don't provide any opinions in your declaration concerning the claim language of Claim 5 that indicates that the charge cut-off voltage is set at 4.2 volts; correct?

MR. STAMATOPOULOS: Object to form.

A. In my IPR position -- sorry -- let me rephrase. In my IPR declaration, I've formed the opinion related to '641 in paragraph 58 to 61. That's the one time -- that's the opinion I have.

Q. (BY MR. COLIN) All right. And there's no opinions in paragraph 58 to 61 concerning the fact that the claim language of Claim 5 indicates that the charge cut-off voltage is set at 4.2

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volts; correct?
MR. STAMATOPOULOS: Object to form.
A. Related to Claim 5 in paragraph 59, what I here say that, "Rather than developing new battery materials, the inventors improved utilization of existing cathode materials by adjusting the anode to cathode ratio to appropriate range such that the charge cut-off voltage could safely exceed 4.2 volt without substantial performance loss."
This may not be directly related to Claim 5, but that's the interpretation I had or my opinion.
Q. (BY MR. COLIN) Dr. Yao, you're not answering my questions. We're going to be here all day and I'm going to move the board for additional time if you keep refusing to answer my questions.
MR. STAMATOPOULOS: And --
MR. COLIN: I think this is a good time for a break.

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MR. STAMATOPOULOS: I think before we go on a break, let me just put on the record, since it sounds like you're done with your questioning, to the extent that you're going to move the board or seek any other remedy, I'd ask that you not mention it to the witness directly. You mention it to me outside of the witness's presence. You're not going to intimidate the witness. Okay? You can ask your questions; I'll put my objections; he'll give his answers. If you want to move to the board or to anyone else, you say it to me, not to the witness.
MR. COLIN: That was unnecessary on the record under your own point. I'm not trying to --
MR. STAMATOPOULOS: Saying you're seeking a remedy to the board --
MR. COLIN: -- intimidate the witness -- you're talking over me, which is improper. Your position is noted.
MR. STAMATOPOULOS: Great.
THE VIDEOGRAPHER: We are off the record at 11:04 a.m.
(Recess from 11:04 a.m. to 11:15 a.m.)
THE VIDEOGRAPHER: The time is 11:15 a.m., and we're back on the record.
Q. (BY MR. COLIN) Dr. Yao, it's your opinion the charge cut-off voltage is not a maximum charging voltage; correct?
MR. STAMATOPOULOS: Object to form.
A. Charge cut-off voltage may have the same value as maximum charge voltage.
Q. (BY MR. COLIN) Dr. Yao, you did not an my question. It's your opinion that the charge cut-off voltage is not the maximum charging voltage; correct? It's a measured value, in your opinion?
MR. STAMATOPOULOS: Object to form.
A. In my opinion, charge cut-off voltage could be the same as the charging maximum, at equilibrium state, when the battery reaches

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equilibrium or is fully charged. So that's what I put in my IPR claim construction, paragraph 27.
Q. (BY MR. COLIN) So let's turn to that. This is Exhibit --
A. Page 9. Exhibit 2022.
Q. So you state in Exhibit 2022, paragraph 27, "The '641 patent's use of 'charge cut-off voltage' confirms that the charge is being used to describe the maximum voltage to which the battery is configured to be charged"; correct?
A. That's correct.
Q. And in the last sentence of paragraph 27, you indicate, "In all of these instances the '641 patent refers to the charge cut-off voltage as the charging maximum"; correct?
A. Correct.
Q. Okay. You don't tell the court that the '641 patent refers to the charge cut-off voltage as possibly equivalent to the charging maximum; correct?
MR. STAMATOPOULOS: Object to form.

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A. Can you repeat your question?
Q. (BY MR. COLIN) Right. You told the court that the '641 patent, based on -- oh, let me state this.
Paragraph 27 you cite to various places in the '641 patent; correct? You cite to it at 1:46-49, 1:55-63; correct?
A. Yes.
Q. You cite to this spec in various places?
A. Yes.
Q. And then you state, "In all these instances" -- so '641 patent at 46 to 49 and 1:55-63, "the '641 patent refers to the charge cut-off voltage as the charging maximum"; correct?
A. That's correct.
Q. In paragraph 26 of that same exhibit, 2022, you indicate the charge cut-off voltage is used synonymously with several other terms in the industry; correct?
MR. STAMATOPOULOS: Object to form.
A. Can you be specific what other term is?

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Q. (BY MR. COLIN) Well, my question is, you say in paragraph 26, "Depending on the context, the term 'charge cut-off voltage' is used synonymously with several other terms in the industry which all refer to the maximum voltage to which the battery is configured to be charged"; correct?
A. Correct.
Q. And then you say these terms include the upper charge limit; correct?
MR. STAMATOPOULOS: Object to form.
A. Yes.
Q. (BY MR. COLIN) Okay. And charge cut-off voltage is synonymous with the "upper voltage limit?
A. Yes.
Q. And charge cut-off voltage is synonymous with the cut-off voltage?
A. Yes.
Q. And it's synonymous with the potential limit?

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A. Yes.
Q. So, Dr. Yao, it's your opinion that charge cut-off voltage is not a maximum charging voltage; correct?
MR. STAMATOPOULOS: Object.
A. Charge cut-off voltage is charging maximum in '641 patent.
Q. (BY MR. COLIN) Okay. So you agree -- sorry.
A. Yeah. As I state at end of paragraph 27, "'641 patent refers to the charge cut-off voltage as the charging maximum." It have same value. The charge cut-off voltage is a battery property. And so they have same value at equilibrium.
Q. Dr. Yao, you agree that the charge cut-off voltage is the maximum charging voltage?
A. Yes.
Q. In paragraph 29 of Exhibit 2022, you refer to the file history of the '641 patent; correct?
A. Yes.
Q. Okay. And you cite specifically to the

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Notice of Allowability at 2 to 3?
A. Yeah. Briefly review was, you know, a long time ago.
MR. COLIN: I'd like to introduce what's previously been marked as Exhibit 1003, which is the file history of the '641 patent.
Q. (BY MR. COLIN) And, Dr. Yao, I would direct you to I believe it's page 22. Oh, sorry. 23 to 24.
So this is the Notice of Allowability you referred to in your claim construction declaration in paragraph 29?
A. Yes.
Q. Okay. And at the bottom of page 2 going on to page 3, I'll read it. "And there was nothing taught by the prior art of record to reasonably arrive at the claim configuration. Moreover, JP '559 teaches that life cycle property of a cell drastically decreases when the charging voltage increases beyond 4.2 volts." Do you see that?
A. Yes.

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Q. Okay. So in this case in the Notice of Allowance, the examiner is referring to charging voltage above 4.2 volts?
MR. STAMATOPOULOS: Object to form.
A. Yes.
Q. (BY MR. COLIN) Okay. Dr. Yao, is it your opinion that the examiner is using "charge cut-off voltage" synonymously with "charging voltage"?
MR. STAMATOPOULOS: Object to form. Scope.
A. Can you repeat?
Q. (BY MR. COLIN) Sure. Dr. Yao, is it your opinion that the examiner is using "charge cut-off voltage" synonymously with "charging voltage" in the Notice of Allowance for the '641 patent?
MR. STAMATOPOULOS: Same objection.
A. I don't think I was asked to provide an opinion on the patent examiner's statement.

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Q. (BY MR. COLIN) Well, you cited to page 2 to 3. You cited to this document in Exhibit 2022 in your claim construction declaration; correct? In paragraph 29, you cited the Notice of Allowability at 2 to 3?
A. That's right.
Q. And I'm asking you, in this document that you cited to in support of your claim construction position, is it your opinion that the examiner is using "charge cut-off voltage" synonymously with "charging voltage" in the Notice of Allowance for the '641 patent?
MR. STAMATOPOULOS: Same objections.
A. As I stated in my Apple construction, the context -- depend on context. The term "charge cut-off voltage" is used synonymously with several other term in the industry. For example, the upper charge limit. I think that the patent examiner here, they referred to charge voltage as the upper charging limit.
Q. (BY MR. COLIN) Dr. Yao, that was not an answer to my question.

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My question is, is it your opinion that the examiner is using "charge cut-off voltage" synonymously with "charging voltage" in the Notice of Allowance for the '641 patent?
MR. STAMATOPOULOS: Same objections.
A. My opinion is that "charge cut-off voltage" is not synonymous with "charging voltage." Because they may have a same value at equilibrium. But why is it applied voltage, the charge voltage? The charge cut-off voltage is a property of the battery.
Q. (BY MR. COLIN) Dr. Yao, you have not answered my question again. My question, is it your opinion that the examiner is using "charge cut-off voltage" synonymously with "charging voltage" in the Notice of Allowance for the '641 patent?
MR. STAMATOPOULOS: Objection to form, scope.
A. I don't know what the patent examiner is thinking at the time.

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Q. (BY MR. COLIN) So you have no opinion on what the patent examiner is doing or whether he's using "charge cut-off voltage" synonymously with "charging voltage"?
MR. STAMATOPOULOS: Object to form.
A. Because you are asking what, you know, the patent examiner is doing, I don't have an opinion on that.
MR. COLIN: Let's mark as a new exhibit -- I think we're on 130 -- 1037. Or is this 1038? 1038.
(Exhibit 1038 marked)
Q. (BY MR. COLIN) And this is plaintiff RJ Technology, LLC's opening claim construction brief.
So turn to page 10 of this document, line 14.
So RJ Tech told the court that "The examiner understood the term the same way, using charge cut-off voltage without reference to a

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particular charging algorithm and in many ways synonymously with charging voltage." Do you see that?

A. Yes.

Q. Do you disagree with that statement?

MR. STAMATOPOULOS: Object to form, scope.

A. Can you repeat your question?

Q. (BY MR. COLIN) Do you disagree with RJ Technology's statement to the court that the examiner understood the term the same way using "charge cut-off" without reference to a particular charging algorithm and in many cases synonymously with "charging voltage"?

MR. STAMATOPOULOS: Same objections.

A. There's a statement in their statement, you know, charge -- charge cut-off voltage in many cases is synonymous with charging voltage.

Q. (BY MR. COLIN) Okay. Further down on lines 26 to 28, RJ Technology told court, "the extrinsic sources confirm that the 4.2 volt limit

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was a maximum charging voltage and not a particular algorithm for implementing that voltage"; correct?

A. Which one? So which -- which -- which page?

Q. On page 10, lines 26 to 28, RJ Tech told the court that "the extrinsic sources confirm that the 4.2 volt limit was a maximum charging voltage"; correct?

MR. STAMATOPOULOS: Same objections.

A. Yes.

Q. (BY MR. COLIN) And let's turn to page -- paragraph 51 of your declaration here.

In paragraph 51 you state that the charge cut-off voltage is different than the applied voltage; correct? Applied -- let me state that again.

In paragraph 51 of your IPR declaration, you state that the charge cut-off voltage of a battery is different from the applied voltage during charging; correct?

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MR. STAMATOPOULOS: Object to form.

A. As I put in the declaration, those two terms are related but are different.

Q. (BY MR. COLIN) Right. Do you agree -- well, sorry. Let me say that again.

You state that the charge cut-off voltage of a battery is different from the applied voltage during charging; correct? That's your opinion here?

A. Yes.

Q. Okay. Your opinion for claim construction on the charge cut-off voltage are set forth in paragraphs 83 to 97; correct? Of your IPR declaration.

A. Can you repeat?

Q. Sure. Your opinions for claim construction, your opinions that you provide to the board on claim construction for charge cut-off voltage are in paragraphs 83 to 97 of your IPR declaration; correct?

A. Yes.

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Q. Okay. You don't cite to any intrinsic evidence to support your opinions in paragraphs 82 to 96; correct?

MR. STAMATOPOULOS: Object to form.

A. This term is used in the industry broadly. You are right; I didn't cite any intrinsic -- intrinsic evidence.

Q. Okay. The only intrinsic evidence you cite in your analysis of the construction for charge cut-off voltage is in paragraph 97; correct?

MR. STAMATOPOULOS: Object to form.

A. 97. In paragraph 97 I said -- '641 patent?

Q. (BY MR. COLIN) Right. So that's the only intrinsic evidence cite in your analysis of the claim construction for charge cut-off voltage in your IPR declaration is in paragraph 97; right?

MR. STAMATOPOULOS: Object to form.

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A. Yes.
Q. (BY MR. COLIN) Okay. And in 97 you're citing the intrinsic evidence to the patent for an argument concerning full-cell voltage; correct?
MR. STAMATOPOULOS: Object to form.
A. Yes.
Q. (BY MR. COLIN) Okay. In paragraph 84 you mention equilibrium potential and maximum equilibrium potential; correct?
A. Which paragraph?
Q. 84.
A. That's correct.
Q. Okay. As we discussed at length this morning, you didn't mention equilibrium potential or maximum equilibrium potential in your previous claim construction declarations in the Apple litigation; correct?
A. We didn't mention equilibrium, but I think that's -- that's understood as a hypothesis between the two parties.
Q. Okay. And you cite nothing in the '641

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patent discussing equilibrium potential; correct?
A. Say it again.
Q. You cite no support in the '641 patent discussing equilibrium potential; correct?
A. You mean aside from the IPR declaration, or what -- what's your -- I didn't understand your question.
Q. My question is, in paragraph 84 when you're talking --
A. Okay.
Q. -- about equilibrium potential or anywhere else in your declaration, you don't cite anything in the '641 patent that discusses equilibrium potential; correct?
MR. STAMATOPOULOS: Object to form.
A. I didn't cite because I think of this, you know, as common knowledge for POSA.
Q. (BY MR. COLIN) And you cite nothing in your declaration from the patent discussing maximum equilibrium potential; correct?
MR. STAMATOPOULOS: Same

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objections.
A. I didn't cite anything, yeah, for the maximum equilibrium potential.
Q. You cite nothing in the patent indicating that charging needs to be complete for a battery to have a particular charge cut-off voltage; correct?
A. I don't believe I need any reference for this term of the terminology. It's broadly known to the community for POSA.
Q. You've mentioned numerous times this morning and it's also in paragraph 92 that the charge cut-off voltage is a battery property; correct?
A. Can you repeat?
Q. In paragraph 92, you indicate that charge cut-off voltage is a battery property; correct?
A. That's correct.
Q. And you've testified numerous times this morning the charge cut-off voltage is a battery property; correct?
A. Yes.

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Q. You don't cite any support in the patent or anything else for that opinion; correct?
MR. STAMATOPOULOS: Object to form.
A. I didn't cite in this page, 44, because I think that's common knowledge in the community for POSA.
Q. (BY MR. COLIN) All right. So you don't cite any evidence to support your position that the charge cut-off voltage is a battery property; correct?
MR. STAMATOPOULOS: Object to form.
A. Although I didn't cite any intrinsic reference, I do in paragraph 86. I had a discussion on the difference between the applied voltage and the battery voltage.
Specifically, paragraph 86 I stated, "When a battery is being charged, there are two distinct voltage -- potentials -- the applied voltage and the battery voltage. Their relationship can be expressed by the following

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equation: V applied equals U plus eta omega plus eta n-e-g plus eta p-o-s plus eta concentration. V applied is the applied voltage, and U is the battery voltage in equilibrium."

MR. COLIN: All right. Dr. Yao, I'm going to move to strike this as all nonresponsive to my question. This is not answering my question.

Q. (BY MR. COLIN) My question is simply, you don't cite any evidence -- there's no cites to anything in paragraph 86 -- my question is, there's no cite --

A. Yes.

Q. -- to any evidence that support your position that charge cut-off voltage is a battery property; correct?

MR. STAMATOPOULOS: Object to form.

A. I think this is common knowledge as one plus one equals two.

MR. COLIN: Dr. Yao, your -- move to strike as nonresponsive.

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Q. (BY MR. COLIN) You don't cite any evidence in your declaration to support your position that the charge cut-off voltage is a battery property; correct?

MR. STAMATOPOULOS: Same objection. And we oppose -- to the extent you are moving to strike, we oppose that, just for the record.

A. I do not cite because I didn't think it was it needed cite that reference here.

Q. (BY MR. COLIN) Okay. In paragraph 92, you indicate that, "In contrast, the applied voltage is supplied by an external charger, variable, and depending upon factors external to the battery, such as what current is being applied to the battery"; correct?

A. Yes.

Q. Okay. So, again, this goes to your position that the charge cut-off voltage is not a charging voltage; correct?

MR. STAMATOPOULOS: Object to form.

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A. The charge cut-off voltage is not applied voltage.

Q. (BY MR. COLIN) Okay. You have not identified any distinctions in your declaration between charging voltage and applied voltage; correct?

MR. STAMATOPOULOS: Object to form.

A. Can you repeat your question?

Q. (BY MR. COLIN) You have not identified any distinctions in your declaration between charging voltage and applied voltage; correct?

MR. STAMATOPOULOS: Same objection.

A. I think in general that's true.

Q. (BY MR. COLIN) Okay. Go to the '641 patent at column 3, lines 45 to 50. And this is Exhibit 1 -- 1001.

A. Which page?

Q. Column 3, lines 45 to 50. Are you there?

A. Yes.

Q. Okay. Do you want to read that to

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yourself for a second?

A. 41 to 50.

Q. 45 to 50. And line 47, the patent, '641 patent says, "said charging device" -- so let me restate this.

I'll read from 45.

"Yet another object of the present invention is to provide a charging device for the secondary lithium ion cell or battery, said charging device controlling a charge cut-off voltage for the single lithium ion cell." Do you see that?

A. Yes.

Q. So the '641 patent indicates that the charging device controls the charge cut-off voltage; correct?

MR. STAMATOPOULOS: Object to form, scope.

A. I don't think I discussed form opinion on charging device in my IPR declaration.

Q. (BY MR. COLIN) Right. So in your IPR declaration you do -- don't address that portion

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that's back at columns 3, lines 45 to 50, which says that the charging device controlling a charge cut-off voltage for the single lithium ion cell; correct?

A. Yes, I didn't. I didn't form opinion on that.

Q. Okay. But despite the patent indicating that the charging device controls the charge cut-off voltage, it's your testimony to the board that the charge cut-off voltage is a battery property; correct?

A. Yes, I believe charge cut-off voltage is a battery property. Almost every batteries on the back of the battery says charge cut-off voltage, which number is. That's an important parameter for battery. Yes.

Q. Okay. Go to column 4 of the '641 patent at lines 27 to 37. The patent at line 33 indicates "the single lithium ion cell having the adjusted ratios were tested by charging at a charge cut-off voltage at 4.45 volts, 4.6 volts, 4.8 volts, 5.0 volts, 5.2 volts, 5.4 volts, 5.6 --

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5.6 volts, and 5.8 volts." Do you see that?

A. Yes.

Q. Okay. And you provide no opinions on that portion of the specification in your IPR declaration; correct?

MR. STAMATOPOULOS: Object to form.

A. I don't remember I form an opinion on this. Can you point me to -- if I'm wrong?

Q. (BY MR. COLIN) It's not in your declaration, Dr. Yao.

A. Okay.

Q. I'm just confirming that you provide no opinions -- I just -- I'm looking for an answer because I'm entitled to know your testimony.

My question is simply, you provide no opinions in that -- on columns 4, lines 34 to 37 in your IPR declaration, correct, where the patent indicates that the batteries were charged at a charge cut-off voltage of various voltages; correct? You provide no opinions on that?

A. Yes.

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Q. Okay. And so despite the patent indicating that the batteries are charged using various charge cut-off voltages, it's your opinion to the board that charge cut-off voltage is not an applied voltage; correct?

A. These are different batteries. Same material, same battery chemistry, charge -- different charge cut-off voltage would be in different batteries. So it's still consistent with internal -- its battery properties. Yes. That's my opinion.

Q. Dr. Yao, you indicate in paragraphs 94 and 95 that a half cell is used to determine electrode capacity; correct?

A. In my declaration, 94?

Q. Your IPR declaration in 94 to 95. And I'll --

A. That's correct.

Q. -- repeat my -- I'll repeat my question just so it's clear.

You indicate in paragraphs 94 to 95 of your IPR declaration that a half cell is used to

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determine electrode capacity; correct?

A. In paragraph 95, yes, I state that, you know, half cell are typically used to -- to measure the capacity of either a cathode anode with a reference electrode. Typically it's a lithium metal.

Q. So just to be clear, you indicate in paragraph 95 of your IPR declaration that a half cell is used to determine electrode capacity; correct?

A. Yes.

Q. You provide no opinion in your declaration that the capacity of an electrode can be determined using a full cell battery; correct?

A. Can you repeat?

Q. Yeah. You provide no opinion in your IPR declaration that the capacity of an electrode can be determined using a full cell battery; correct?

MR. STAMATOPOULOS: Object to form.

A. I don't remember if I said so. Most -- typically half cell is being used to determine the

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capacity. Full cell is not the best way to determine the electrode capacity.

Q. (BY MR. COLIN) Are you aware -- strike that.

So sitting here today, you don't recall providing any opinion in your IPR declaration that the capacity of an electrode can be determined using a full cell; correct?

A. Full cell could be also used in certain cases -- for example, three electrode configuration.

MR. COLIN: Move to strike as nonresponsive.

Q. (BY MR. COLIN) Dr. Yao, sitting here today --

MR. STAMATOPOULOS: We oppose that, by the way, for the record.

MR. COLIN: Hasn't been answered. I have a running "move to strike" because a lot of this stuff is nonresponsive to my questions.

Q. (BY MR. COLIN) Sitting here today, Dr. Yao, you don't recall providing any opinion in

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your IPR declaration that the capacity of an electrode can be determined using a full cell; correct?

MR. STAMATOPOULOS: Same objections.

A. I believe you can also -- you can determine capacity of electrode using full cell with a three electrode configuration.

MR. COLIN: Move to strike as nonresponsive.

Q. (BY MR. COLIN) Dr. Yao, you provide no opinions in your IPR declaration that the capacity of an electrode can be determined using a full cell; correct?

MR. STAMATOPOULOS: Same objection. Just for the record, we oppose a move to strike. I don't want to have say oppose every time; so I'm just going to put it in the record.

MR. COLIN: That will be standing. Understood.

A. Maybe. Maybe I didn't. I don't remember.

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Q. (BY MR. COLIN) Sitting here today, you don't recall and you cannot find any opinions in your IPR declaration that the capacity of an electrode can be determined using a full cell; correct?

A. Sitting here --

MR. STAMATOPOULOS: Same objection. Sorry. Same objection.

A. Sitting here today, I think you can determine the capacity using a full cell. Is that your question? I think that's the question.

Q. (BY MR. COLIN) That is not my question, Dr. Yao. You're refusing to answer my question.

You provide no opinion in your IPR declaration that the capacity of an electrode can be determined using a full cell; correct?

MR. STAMATOPOULOS: Object to form.

Q. (BY MR. COLIN) If it's in your declaration, show me, because I don't see it. You haven't pointed to anything.

MR. STAMATOPOULOS: Object to the

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form of that last question, if that was a question.

Q. (BY MR. COLIN) Dr. Yao, I'll repeat the question. You provide no opinion in your IPR declaration that the capacity of an electrode can be determined using a full cell; correct?

MR. STAMATOPOULOS: Same objection.

A. So in paragraph 98 in my declaration so relate to the claim on "the ratio calculate as the product of the capacity of the cathode active material per mass unit and the amount of cathode active material in the same mass unit divided by the product of capacity of anode active material per unit mass and the amount of active -- anode active material in the same mass unit, when the charge cut-off is 4.2 volts."

I think that -- that's one way to determine the capacity in the full cell.

Q. (BY MR. COLIN) So it's your testimony here today that the electrode capacity and the capacity ratio limitation is determined using a

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full-cell voltage?
A. The charge cut-off voltage referenced here is a full-cell voltage, yes.
Q. Let's go to paragraph 8 of your second Apple IPR declaration.
A. Which exhibit?
Q. So that Exhibit 130 -- 1036, paragraph 8. Okay. And in paragraph 8 of Exhibit 1036, you cite to a statement made by the inventors in the prosecution history of the Chinese patent; correct?
A. Yes.
Q. At the end of that paragraph you state, "That is consistent with my reading of the claims in the '641 patent"; correct?
MR. STAMATOPOULOS: Object to form.
A. That's what I state here. This is consistent with my reading of the claims. Yes.
MR. COLIN: So let's mark as the next exhibit -- this is Exhibit 3 -- sorry -- would be 1038 -- no, sorry -- 1039.

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(Exhibit 1039 marked)
MR. COLIN: It's Exhibit 3, Chinese patent application, Statement of Argument for Application Number 01141615.7, which is cited in paragraph 8 of Dr. Yao's declaration, Exhibit 1036.
Q. (BY MR. COLIN) So, Dr. Yao, turn to the page marked at the bottom 3578, underscore, Apple. Are you there?
A. Yes.
Q. At section 2.1. Do you see that?
A. That's right.
Q. Okay. And so you understand that this is a statement from the patent inventors; correct? As indicated in your claim construction declaration, this is a statement by the Chinese inventors?
A. Yes.
Q. Okay. And in section 2.1 they state, "The positive and negative electrode ratio mentioned in Claims 1 and 2 can easily be calculated as follows." They said, "The said

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positive to negative ratio equals the product of the amount of active material in the positive electrode of a lithium ion battery and its specific capacity," parentheses, "gram capacity, i.e., capacity per unit amount of active material," close parens, "when the charging potential relative to lithium metal is 4.2 volts."
And it goes on to indicate for the negative electrode, again, "when the charging potential relative to lithium metal is 4.2 volts." Do you see that?
MR. STAMATOPOULOS: Object to form.
A. Yes. Can I read this sentence?
Q. (BY MR. COLIN) Okay. So the Chinese inventors, the statement -- sorry. Let me re- -- fix that.
So the inventors, during the prosecution history of the Chinese patent, indicated that the ratio of positive to negative electrode ratio is calculated with a charging potential relative to lithium metal at 4.2 volts; correct?

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MR. STAMATOPOULOS: Object to form.
A. Can you repeat your question?
Q. (BY MR. COLIN) Sure.
A. Better question.
Q. The inventors during prosecution history of the Chinese patent that's related to the '641 patent indicated that the ratio of positive to negative electrode is calculated with a charging potential relative to lithium metal at 4.2 volts; correct?
A. Yes.
Q. Okay. And in your claim construction declaration to the court, referring to this document, you state in paragraph 8 in the Chinese patent prosecution history, "The inventors explained to the examiner in China that to calculate the claimed ratio, the capacity at a charge cut-off voltage at 4.2 volts should be used"; correct? That's in your declaration?
A. Yes.
Q. Okay. And you told the court that "the

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statement by -- made during the Chinese patent prosecution is consistent with my reading of the claims in the '641 patent"; correct?

MR. STAMATOPOULOS: Object to -- object to form. You can answer.

A. Yes.

MR. COLIN: Let's take a break.

THE VIDEOGRAPHER: Off the record at 12:16 p.m.

(Lunch recess from 12:16 p.m. to 1:02 p.m.)

THE VIDEOGRAPHER: The time is 1:02 p.m., and we're back on the record.

Q. (BY MR. COLIN) Good afternoon, Dr. Yao.

A. Good afternoon.

Q. Did you discuss any of the substance of your testimony during the break today?

A. No, I didn't.

Q. Okay. So turning back to your IPR declaration in paragraph 97 -- wait till you get there. Okay.

So in the second sentence of paragraph

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97, you indicate that the claims refer to the charge cut-off voltage of a secondary lithium ion battery; correct?

A. Yes.

Q. Okay. So if we turn to the '641 patent, which is Exhibit 1001, could you turn to Claim 5, please.

A. Yes.

Q. Okay. And so for the -- you know, what we've been referring to on all morning, right, is the charge cut-off voltage limitation; right? The claim read, "The secondary lithium ion cell or battery has a charge cut-off voltage of great than 4.2 volts but less than 5.8 volts; correct?

A. Yes.

Q. Okay. So that's what you were referring to when you say the claims refer to charge cut-off voltage of the secondary lithium ion cell or battery because it's directly right in that limitation; correct?

MR. STAMATOPOULOS: Object to form.

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A. Yes.

Q. (BY MR. COLIN) Okay. And when you look at -- you understand if I say "the capacity ratio limitation," you understand that that's the next limitation in the claims?

A. So --

Q. And rather than saying the whole limitation, which is, you know, the ratio of positive electrode materials. So if I refer to the next limitation in Claim 5 is "the capacity ratio limitation," you understand what I'm referring to?

A. So were you referring to the Claim 5 --

Q. Yeah, yeah.

A. -- or the claim construction we have?

Q. No, no, no. Just -- I'm just -- if I say "the capacity ratio limitation," you understand I'm referring to the limitation that reads: the ratio of positive electrode material to negative electrode material of the secondary lithium ion cell or battery is from 1 to 1.0 to 1 to 2.5 as calculated by a theoretic capacity with a charge

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cut-off voltage set up 4.2 volts.

A. Okay.

Q. You understand that portion of the claim if we say charge cut-off -- sorry -- "capacity ratio limitation"?

A. Yes.

Q. Okay. So if we're just talking about the capacity ratio limitation, that last portion of the claim, it says the charge cut-off voltage set at 4.2 volts; correct? It doesn't say "of the lithium -- secondary lithium ion cell or battery in that limitation"; right?

MR. STAMATOPOULOS: Object to form.

A. I didn't understand the question. Yeah.

Q. (BY MR. COLIN) Okay. I'm just saying, when it says "charge cut-off voltage set at 4.2 volts," it doesn't say "charge cut-off voltage set at 4.2 volts for the secondary lithium ion cell or battery"; right? That's not written in the claim language?

MR. STAMATOPOULOS: Object to

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form.
A. You're correct.
Q. (BY MR. COLIN) Okay. So in paragraph 97 you go on to say, "the specification explains that as the lithium cobalt oxide that is used as a positive electrode material in most commercial lithium ion batteries, the charge cut-off voltage is limited to below 4.2 volts," then you have ellipses. And then it says, "although many documents indicate that the charge cut-off voltage can be over 4.2 volts for a test cell using metallic lithium as counter electrode," and you cite to the patent at columns 1:64 to 2:3; right?
A. Yes.
Q. Okay. So at the top of column 2 in lines 1 to 3, the patent specification refers to "the charge cut-off voltage can be over 4.2 for a test cell using metallic lithium as a counter electrode"; correct?
A. Were you referring to the claim or --
Q. No, column 2, lines 1 to 3.
A. Okay.

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Q. My question simply is that the patent specification is referring to a "charge cut-off voltage can be over 4.2 volts for a test cell using metallic lithium as a counter electrode"; correct?
A. Which one are you referring to?
Q. Column 2, lines 1 to 3, the part that you cite in paragraph 97.
A. Oh.
Q. Column 2. So it's --
A. Column 2.
Q. No. You're already -- right. Top right of the page.
My question is simply, the patent specification refers to a charge cut-off voltage can be over 4.2 volts using a -- for a test cell using metallic lithium as a counter electrode; correct?
A. Yes, you can use a metallic lithium as a counter electrode in some of the cells, half cells.
Q. Right. And specifically the '641 patent

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uses the phrase "charge cut-off voltage" in connection with a half cell; correct? In lines -- column 2, lines 1 to 3.
A. I think, you know, the Claim 1 of 5 and the claims -- one -- yeah -- mention -- in Claim 5, mention two charge -- charge cut-off voltage. In the first place one say charge cut-off voltage greater than 4.2 volt but less than 5.8 volt. This is referring to full cell because that's where the charge cut-off voltage is.
And -- and then later, the end of this Claim 5 where it says that theoretic capacity with a charge cut-off voltage at 4.2 volt. So that's essentially, you know, it's theoretic capacity calculation. I think this relates with the -- with the half cell, was the reference, lithium metal.
Q. Okay. So just to break it down, it's your understanding that for the charge cut-off limitation, which is between, you know, 4.2 volts to 5.8 volts, that's for a full-cell voltage; correct?

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A. Yes.
Q. Okay. And so for the capacity ratio limitation, when you're talking about electrode capacity, it's your opinion that that's referring to a half cell capacity relative to a reference electrode; correct?
MR. STAMATOPOULOS: Object to form.
A. Yes.
Q. (BY MR. COLIN) In paragraph 51 of your IPR declaration, you indicate -- wait for you to get there -- in the last sentence, "at the time of the '641 patent, it was conventional to limit the charge cut-off voltage to 4.2 volts or lower"; correct?
A. Yes.
Q. You don't cite anything in that paragraph to support that opinion?
A. I didn't because I think that's -- to the POSA that's a known fact, known entity.
Q. Are you aware that the patent office rejected that argument during the prosecution

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history of the child application of the '641 patent after it reviewed the Guyomard reference that is cited in the petition?

A. I -- I may have read those, you know, for certain history, but I didn't, you know, pay attention to all the details. So I don't remember the history of the patent history particularly on your question.

Q. Sure. So I'll introduce what's already been marked as Exhibit 1004, which is the prosecution history of Patent Application Number 12/817028. And I'll direct you specifically to page 33. Are you with me? It's labeled page 33 of 254 at the bottom right?

A. Yes.

Q. Okay. And if you go to the section that's labeled, "Response to Arguments" kind of in the middle of the page, do you see that?

A. Yes.

Q. Okay. And the second sentence, the patent office says, "In response to applicant's argument that using the cut-off voltage above 4.2

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volts is wholly unforeseen by the art is not true." Do you see that?

A. Yes.

Q. Okay. And the examiner goes on to say, "The reference W0 93/21665 teaches using cut-off voltage above 4."2 volts. Do you see that?

A. Yes.

Q. Okay. And do you understand that the W0 93/21665 is the Guyomard reference cited in this petition?

MR. STAMATOPOULOS: Object to form.

A. Yes.

Q. (BY MR. COLIN) You provide no opinions in your declaration concerning the patent office assertion that patent applicant's argument that using the cut-off voltage above 4.2 volts is wholly unforeseen by the art is not true. Correct?

MR. STAMATOPOULOS: Object to form.

A. Can you repeat your question?

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Q. (BY MR. COLIN) You've testified today -- I'm not trying to trip you up -- that you provided no opinions in your IPR declaration on the prosecution history on the '641 patent or the child application; correct?

MR. STAMATOPOULOS: Objection.

A. Yeah, I don't -- I don't recall provide opinion on the prosecution history of this.

Q. (BY MR. COLIN) Right. So my question was simply, you provided no response to the US Patent and Trademark Office's finding that "patent applicant's argument that using the cut-off voltage of 4.2 volts is wholly unforeseen by the art is not true." Correct?

MR. STAMATOPOULOS: Objection.

A. It seems the reference cited here, WO 93-21665, cannot be used as evidence to -- against the cut-off voltage above 4.2 volt because this reference used this manganese oxide as a cathode material. As I state in my deposition in paragraph 206, page 106, that, you know, that I cite a reference here, 1005, because a charge

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cut-off voltage limit manganese oxide due to its own chemical stability. Beyond this voltage limit the structure of lithium manganese oxide can start to break down. Considering the risk of cathode dissolution, a POSITA did not have motivation to increase the charge cut-off voltage beyond 4.2 volt. So I don't think there's a strong, you know, reason to increase the voltage above 4.2 volts.

MR. COLIN: Move to strike as not responsive.

Q. (BY MR. COLIN) Dr. Yao, my question was simply, you do not provide any opinions in your declaration responding to the patent examiner's finding that is already known to use cut-off voltages above 4.2 volts; correct?

MR. STAMATOPOULOS: Same objection.

A. I think it provides an opinion, Guyomard's reference, right, in the paragraph 75 to 78 in my declaration. Also -- I also provide, you know, additional opinion in page 105 which I

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just didn't read related paragraphs. So I don't know what exactly, you know, opinion you are referring to; but I think I did provide some opinions related to this charge cut-off voltage in this reference.

Q. (BY MR. COLIN) So it's your testimony to the board that no one in the art prior to 2001 was charging cathode materials above 4.2 volts?

MR. STAMATOPOULOS: Object to form.

A. I didn't -- I didn't say that.

Q. (BY MR. COLIN) So, Dr. Yao --

A. That's not my opinion in that declaration.

Q. Right. Because you're well aware that there were laboratories, papers, publications teaching to charge cathode materials above 4.2 volts, correct, prior to 2001?

MR. STAMATOPOULOS: Object to form.

A. I provide an opinion relate to, you know, the charge cut-off voltage for lithium cobalt

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oxide in paragraph 52 whereas charge cut-off voltage for lithium cobalt oxide has been limited to 4.2 volts as it was understood that at voltage higher than 4.2 volt lithium cobalt oxide can undergo irreversible structure change and oxygen loss, which not only degrades the material's capacity and cycling stability, but also poses risks of thermal runaway and battery failure.

You can apply voltage higher than 4.2 volt, but that would lead to the consequence such as structure change and oxygen loss and thermal runaway. It's not desired for higher -- voltage higher than 4.2 volt.

So also I apply my opinion in paragraph 54 for spinel lithium manganese oxide. So this is a different structure compared to lithium cobalt oxide in paragraph 54.

As I state here, "Because of its low cost and environmental friendliness, lithium manganese oxide seemed to be a promising cathode material. However, over time, enthusiasm waned as the changes related to the material's surface --

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stability surfaced."

So "Specifically, the dissolution of manganese in the electrolyte during battery operation led to significant issues with cycle life and capacity retention. It was known that attempting to increase the charge cut-off voltage above 4.2 volt caused oxidation of the electrolyte and the spinel without the benefit of additional capacity."

So which means, you know, that's no additional capacity above 4.2 volt. Even you charge to 4.3 volt, there's no additional benefit. Therefore, and but only -- it would lead to more capacity decay. There's no really motivation to increase the voltage above 4.2 volt for spinel material system.

Therefore, I think, you know, that's my opinion relate to what you are asking.

Q. So it's your opinion that Guyomard does not teach a charge cut-off voltage above 4.2 volts?

MR. STAMATOPOULOS: Object to the

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form of the question.

A. Do you have reference out of this Guyomard's claim -- patent? 1008.

Q. (BY MR. COLIN) I give you what's previously been marked as Exhibit 1008, which is the Guyomard reference. But let me direct you to your own IPR declaration on paragraph 77. Are you there?

A. Yes.

Q. Okay. So paragraph 77, third sentence, you say, the charge and discharge of these test cells were performed, quote, at 25 degrees C and 55 degrees C and at charging cut-off voltages of 4.9 volts and 4.5 volts respectively, close quotes, quoting Guyomard at page 8, lines 32 to 37; correct?

A. Yes, correct.

Q. So looking at your own declaration, looking at Guyomard, is it your opinion that Guyomard does not teach charge cut-off voltages over 4.2 volts?

MR. STAMATOPOULOS: Object to

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form.
A. I think that, you know, the patent, '641 patent teaches cut-off voltage higher than 4.2 volt without significant decrease of battery performance. In the Guyomard patent, they do teach charge cut-off voltage above 4.2 volt; but the capacity loss compared with the fixed cycle, as indicated my paragraph 78 of my declaration, is not considered good performance. So this is different from '641 patent.
Q. So you agree with me that Guyomard discloses the charge cut-off voltage over 4.2 volts; correct?
MR. STAMATOPOULOS: Object to form. And scope.
A. In my declaration, paragraph 78, I do state Guyomard did not disclose any detail about the performance of the battery or state of the cathode using such test conditions. Indeed, Guyomard only disclosed the charge cut-off voltage but does not specify the details like charging and the charging conditions such as the current.

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Therefore, I -- but, therefore, that's -- you know, that's my opinion, that Guyomard does not disclose, you know, details of charge cut-off voltage above 4.2 volt.
Q. (BY MR. COLIN) Okay. So just to get that clear, it's your opinion that Guyomard does not disclose a charge cut-off voltage above 4.2 volts?
MR. STAMATOPOULOS: Object to form and scope.
A. You are right. I think I, no, didn't discuss the charge cut-off voltage of the battery above 4.2 volts.
Q. (BY MR. COLIN) Okay. In paragraph 77 you cite a portion of Guyomard which indicates "there was no significant loss of cell capacity verifying the high voltage stability of the electrolyte. The ability of the electrolyte to extend the cycle life was batteries was amply demonstrated by the remarkable fact that the cell capacities after 500 cycles was only about 10 percent less than after five cycles." And you

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cite page 9, lines 3 to 8; correct?
A. That's correct.
Q. Okay. So you're telling the board that by providing the capacity loss after 500 cycles of only about 10 percent or less does not tell you anything about the performance of the cathode in Guyomard?
A. Well, our typical method of battery capacity retention is compared to the first discharge cycle, not compared to the fifth cycle. Therefore, because we -- there's not enough information to know how does the cell capacity of the fifth -- 500th cycle compare to the first cycle. Maybe it's going to decrease significantly to the first five cycles.
Q. The first several cycles of the battery are the formation cycles; correct?
MR. STAMATOPOULOS: Object to form.
A. Formation cycle of a battery typically can be complete in one or two cycles. From my understanding, typically -- well, doesn't last

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five cycles.
Q. (BY MR. COLIN) Commercial batteries are cycled several times before being sold to customers; correct?
MR. STAMATOPOULOS: Object to form.
A. Yeah. Commercial batteries goes through a formation cycle. And, you know, typically one or two cycles of slow rate. And factories are trying to minimize the time to reduce the cost for the formation process. So I don't think five cycles can be considered the formation process.
Q. (BY MR. COLIN) You provide no opinion in your declaration concerning whether cycling should be measured preformation or postformation with respect to the claims; correct?
A. I think that's correct.
Q. Manufacturers report the capacity of batteries as the postformation capacity; correct?
MR. STAMATOPOULOS: Object to form.
A. I think that's correct.

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Q. (BY MR. COLIN) And you don't provide any opinion in your declaration that the capacity of the first cycle is required to determine whether a reference teaches the capacity loss percentage of the dependent claims; correct?

MR. STAMATOPOULOS: Object to form.

A. That's correct.

Q. (BY MR. COLIN) You criticize Guyomard in paragraph 78 for not specifying the details of charging and discharging conditions such as current; correct?

A. That's correct.

Q. But the patent, the '641 patent also does not disclose the details of the charging or discharging conditions for any of the examples; correct?

MR. STAMATOPOULOS: Object to form.

A. Well, I have an opinion on Guyomard patent. I was not asked to form opinion on '641 patent.

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Q. (BY MR. COLIN) Well, I'm asking you sitting here today, I mean, you criticized Guyomard for not specifying charge and discharge conditions such as the current; but there's no more details in the patent in suit on those conditions. Correct?

MR. STAMATOPOULOS: Object to form.

A. Can you clarify? What do you mean, "in suit"?

Q. (BY MR. COLIN) The '641 patent does not specify the charge or discharge conditions for cycling; correct?

MR. STAMATOPOULOS: Object to form.

A. I think so.

Q. (BY MR. COLIN) Just to be clear, you're agreeing with me that the '641 patent does not specify the charge or discharge conditions for cycling; correct?

MR. STAMATOPOULOS: Objection. Form.

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A. You are correct.

Q. (BY MR. COLIN) And the '641 patent does not provide any details concerning the cathode after 400 cycles other than the cycling capacity loss; correct?

MR. STAMATOPOULOS: Object to form. Scope.

A. I would assume they are comparing the first, you know, cycle after formation. They did the measure the first -- fifth cycle. So this is, you know, different from the Guyomard patent.

Q. (BY MR. COLIN) You provide no opinions on whether cycling in the patent suit was from the very first cycle or after formation; correct? That's not in your declaration?

MR. STAMATOPOULOS: Object to form.

A. So in my Apple claim construction, page 203, paragraph 30 -- 74, I do provide -- you know, I state the battery manufacturer determines how much of the battery's initial capacity is retained and the success for charge cycles using basic

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math, as can be seen in the ratio below. The remaining capacity divided by initial capacity. So I assume, the -- you know, the comparison should be compared to initial capacity. So that's why opinion --

Q. (BY MR. COLIN) Okay. So just to be clear, in your Apple declaration, Exhibit 2022, in paragraph 74, it's your opinion that initial capacity should be determined from the first cycle?

A. That's correct.

Q. Okay. And in your IPR declaration you don't provide the board with any opinions on whether the initial capacity should be measured from the first cycle or after formation; correct?

A. I have the same opinion as what we have in the claim construction.

Q. I understand what you're telling me today. I understand that. I'm just saying, in your IPR declaration to the board, you didn't provide any opinions on whether initial capacity should be measured from the first cycle or after

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formation; correct?
MR. STAMATOPOULOS: Object to form.
A. No, I was not asked to form opinion on that.
Q. (BY MR. COLIN) Okay. You provide no opinions in your IPR declaration concerning the board's institution decision; correct?
MR. STAMATOPOULOS: Object to form.
A. Can you repeat again?
Q. (BY MR. COLIN) Yeah. I'm just trying to clarify. You provided no opinions -- and I have not seen any in your declaration. So I'm not -- again, I'm not trying to trick you. I'm just making sure, trying to get --
A. Okay.
Q. -- a clear record -- you provided no response in your IPR declaration concerning the board's findings in the institution decision for the IPR proceedings; correct?
MR. STAMATOPOULOS: Object --

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A. Yes.
MR. STAMATOPOULOS: -- to form.
Q. (BY MR. COLIN) Are you aware that the board rejected RJ Technology's argument that the prior art cautioned against raising the charge cut-off voltage in the institution decision?
MR. STAMATOPOULOS: Object to form.
A. Which exhibit do you refer to?
Q. (BY MR. COLIN) Would you like me to give it to you?
A. Is that in the exhibits? Yeah.
Q. Not yet.
A. Yeah.
Q. I can introduce it. This is already marked by paper number 10, which is the board's institution decision. And you already testified before you provided no opinions on your institution decision in your declaration.
And my question was simply, are you aware that the board rejected RJ Technology's argument that the charge cut-off voltage -- let me rephrase

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that.
My question was simply, are you aware that the board rejected RJ Technology's argument that the prior art cautioned against raising the cut-off voltage in the institution decision?
MR. STAMATOPOULOS: Object to form.
Q. (BY MR. COLIN) I could direct you to page 20 if you're trying to find the statement.
In the first paragraph on the top the board indicated "on this record we are not persuaded that Uemura or the prior art as a whole teaches against using a charge cut-off voltage of 4.3 volts anymore"; correct? Do you see that?
A. Yes, I do.
Q. And you provided no opinions responding specifically to the board's finding in the institution decision; correct?
MR. STAMATOPOULOS: Object.
A. To answer your question, you are correct I didn't provide opinion on the institution decision; but I do provide my opinion related to

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the topic you mention in the paragraph 117 and the -- to 119 of my declaration, related the same measure.
Q. (BY MR. COLIN) Okay. So in the Apple litigation RJ Technology did not include the word "theoretic" or "theoretical" in its proposed construction; correct?
MR. STAMATOPOULOS: Object to form.
MR. COLIN: Let me rephrase that.
Q. (BY MR. COLIN) In the Apple litigation, RJ Technology did not include the word "theoretic" or "theoretical" in its proposed construction of the capacity ratio limitation; correct?
MR. STAMATOPOULOS: Same objection.
A. In the Apple claim construction, Exhibit 2022, you're correct that it didn't provide theoretical, but I think the understanding is that here the meaning is theoretical capacity. This is referred to in the paragraph 41 which I state I agree that --

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Q. (BY MR. COLIN) Dr. Yao, you keep answering your own questions rather than the one I asked. Please respond to the questions. Your counsel could ask all your opinions on everything else.

A. Hm-hm.

Q. But please respond to the questions.

MR. STAMATOPOULOS: Please don't interrupt the witness.

MR. COLIN: The witness is providing nonresponsive answers all day long, largely refusing to answer my questions.

MR. STAMATOPOULOS: That is your view. Please don't interrupt the witness. You can move to strike at an appropriate time if you want.

MR. COLIN: He's wasting the time on the record. He's been doing it all day. We may need to seek extra time if this keeps going.

MR. STAMATOPOULOS: You are welcome to call the board and seek extra time. We're going to oppose that request.

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MR. COLIN: I understand.

MR. STAMATOPOULOS: In the meantime, let him answer his -- provide his answer --

MR. COLIN: He already answered the question.

MR. STAMATOPOULOS: Have you finished your answer, Doctor?

MR. COLIN: You're not asking him questions, Counsel.

MR. STAMATOPOULOS: You're not going to interrupt him. You're not going to interrupt him, Jeff. He's entitled to finish his answers. You're entitled to object to those answers.

MR. COLIN: Counsel, you're now wasting my time as well.

MR. STAMATOPOULOS: All right.

Q. (BY MR. COLIN) Dr. Yao, RJ Technology did not include the word "theoretic" or "theoretical" in its proposed construction for the capacity ratio limitation in the Apple litigation; correct?

A. I think I already answered earlier. This is just not -- no, sir, I didn't in the claim litigation.

Q. And you agreed with RJ Technology's proposed construction for the capacity ratio limitation in the Apple litigation; correct?

MR. STAMATOPOULOS: Object to form.

A. I think there should have been a theoretical capacity there. I think that's what was adopted in the Samsung IPR declaration.

Q. (BY MR. COLIN) Dr. Yao, the court construed the capacity ratio limitation without the word "theoretic" or "theoretical" in it; correct?

A. You are right, there is no "theoretical" in the claim construction. But from all the paragraphs forwarding in this claim construction, I think it was referring to theoretic capacity instead of just capacity. There are several places to support this claim because in paragraph

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41 it says -- specific says just, you know, the battery's theoretic capacity.

Also, in the end of the paragraph 45, a POSA would understand this is as a theoretic capacity of the material at the stated voltage. If it's not referring to theoretic capacity, there's no way for a POSA to calculate a capacity at that voltage. It's obvious it should refer to theoretical capacity. That's my opinion.

Q. (BY MR. COLIN) Dr. Yao, if you could turn to the court's claim construction order which is already marked as Exhibit 2010. You have it in front of you.

A. Yes.

Q. If you turn to the next-to-last page of the decision, it's page 31 of 32. Are you there?

A. Yes.

Q. Okay. This page, you agree with me, has the Central District of California's claim construction for the capacity ratio limitation in the term number 2?

A. Yes.

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Q. And the district court construed the claim as the ratio calculated as the product of the capacity of the cathode active material per mass unit and the amount of cathode active material in the same mass unit divided by the product of the capacity of the anode active material per mass unit and amount of the anode active material in the same mass unit when the charge cut-off voltage is 4.2; correct?

A. Yes.

Q. Okay. The court's construction for the capacity ratio limitation does not include the word "theoretic" or "theoretical"; correct?

A. Yes.

Q. In your opinion to the board and the claim construction you apply in the IPR, you require capacity to be theoretic capacity; correct?

A. Yes.

Q. In paragraphs 98 to 114, you provide your opinions on claim construction for this term in the IPR; correct?

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A. Which paragraph?

Q. 98 to 114 of your declaration for the IPR.

A. Yes. That's correct.

Q. So in this section, you cite to the patent only twice; correct? In paragraph 100 and paragraph 110?

A. That's correct.

Q. Okay. In paragraph 100 you cite to column 8, lines 50 to 55, which is the portion of the specification that refers to the negative electrode; correct?

A. That's correct.

Q. Okay. And in paragraph 110 you cite to the language of Claim 5?

A. That's correct.

Q. Okay. You don't cite to any other intrinsic evidence in support of your proposed claim construction in your IPR declaration; correct?

A. That's correct.

Q. So in your opinion, a measured capacity

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is not a capacity under the claim construction for the capacity ratio limitation?

A. That's correct. Because measured capacity depends on many testing conditions. It's very hard for -- you know, for the POSA to design a battery.

Q. Okay. An actual capacity or measured capacity is the same understanding; right?

MR. STAMATOPOULOS: Object to form.

A. Say it again?

Q. (BY MR. COLIN) So in your opinion, an actual capacity is not the capacity under the claim construction; correct?

MR. STAMATOPOULOS: Object to form.

A. No. I think the claim is referring to theoretical capacity.

Q. (BY MR. COLIN) Okay. So if you turn to column 1, lines 42 to 44 of the '641 patent.

A. Which column?

Q. Column 1, lines 40 to 44.

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A. Okay.

Q. Okay. And you see where the patent says, "For lithium cobalt oxides as a positive electrode material with secondary lithium ion cell has a theoretical capacity of 248 milliamp-hours per gram or the actually used capacity of it is merely about 140 milliamp-hours per gram -- i.e., about half of said theoretic capacity -- is not utilized." Do you see that?

A. Yes.

Q. Okay. So it's your opinion that if you refer to actually used capacity for a material, that doesn't fall under the claim construction for the capacity ratio limitation; correct?

MR. STAMATOPOULOS: Object to form.

A. I do not see the connection of this place with the claim file. But you are right. I think the theoretical capacity in Claim 5.

Q. (BY MR. COLIN) Okay. And in the bottom of column 1 in the '641 patent around lines 65 to 67, the patent indicates "the charge cut-off

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voltage is limited to below 4.2 volts, and the actual capacity is 120 to 140 milliamp-hours per gram -- i.e., if you have 50 percent of the theoretical capacity is not -- is not the capacity."

So, again, when the patent specification is talking about actual capacity, that's not a theoretic capacity at 4.2 volts; correct?

MR. STAMATOPOULOS: Object to form.

A. The capacity, it needs to be better defined. That's what I put in my opinion in paragraph 104. So basically I have three distinct types of capacity for an electrode: Theoretical maximum capacity, theoretical capacity at 4.2 volt, and the practical specific capacity.

So what you're referring here I think is that talking about in the top actual capacity that's for in the category of practical specific capacity, it's experimental matter. So that's not the theoretical capacity or not the theoretical maximum capacity.

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Q. (BY MR. COLIN) Okay. You cite nothing in the '641 patent as providing an example of a material with a theoretic capacity of 4.2 volts in your declaration; correct?

MR. STAMATOPOULOS: Object to form.

A. Can you repeat?

Q. (BY MR. COLIN) Right. You don't cite anywhere in the '641 patent where it provides an example of how to determine a theoretic capacity of 4.2 volts for any material; correct?

MR. STAMATOPOULOS: Object to form.

A. I think I, you know, talk about provide opinion on my -- on the specific parity of 4.2 volts for lithium cobalt oxide is about 177 medium power -- 170 -- 177 medium power per gram. That's in the paragraph 0009 on my deposition.

Q. (BY MR. COLIN) Right. But I'm asking you a specific question. That's not my question. I understand you have your opinions on how you calculate a theoretic capacity of 4.2 volts.

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My question is simply, you don't cite anywhere in the '641 patent where it provides an example or a teaching of how to determine the theoretic capacity of 4.2 volts for any material; correct?

MR. STAMATOPOULOS: Object to form.

A. I didn't cite any in the '641 patent, that's correct.

Q. (BY MR. COLIN) In your opinion, a design capacity is not a capacity under the claim construction?

MR. STAMATOPOULOS: Object to form.

A. Can you point me to where I have this in my declaration, regarding design capacity?

Q. (BY MR. COLIN) Well, Abe refers to design capacity; correct?

A. Yes.

Q. Okay. And it's your opinion that the design capacity of Abe is not the claim capacity; correct?

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A. You are correct. In paragraph 202, I said because Abe's design capacity is determined is lower voltage than the voltage used to determine the capacity of the cathode depending on the cathode material, Abe's design capacity is likely lower than the theoretical capacity of the claim material at the 4.2 volt, which is Claim 5.

Q. All right. That's a little bit different than my question, though, sir. I'm just asking, it's your opinion that design capacity of Abe, which is determined by actually measuring values using a three electrode cell, does not provide you with theoretic capacity of 4.2 volts; correct?

MR. STAMATOPOULOS: Object to form.

A. You are right.

Q. (BY MR. COLIN) Okay. If you turn back to your Apple claim construction declaration, the first one, Exhibit 2022. Please turn to paragraph 47.

A. Yes.

Q. Okay. So you told the district court

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that the '641 patent defines theoretic capacity of the positive electrode to mean, and in quotes, "the capacities of the positive electrode," dot dot dot, "calculated with the charge cut-off voltage set at 4.2 volts"; correct?

A. Yes.

Q. Okay. And you cite the '641 patent at column 4, lines 5 to 9?

A. Yes.

Q. Okay. And you state, "the specification here does not say it is the theoretical maximum but the capacity at 4.2 volts"?

A. Yes.

Q. Okay. So if we turn back to the patent in suit, at column 4, lines 5 to 9 -- let me strike that.

You don't provide -- let me start over.

You don't tell the board anywhere in your IPR declaration that the patent defines the term "theoretical capacity;" correct?

MR. STAMATOPOULOS: Object to form.

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A. No, I didn't.

Q. (BY MR. COLIN) Okay.

A. I assume it's common knowledge in the field for POSA. The -- you know, calculate, how you calculate the definition of this capacity are known to the POSA in the -- at that time.

Q. So you told the district court that the patent defines theoretical capacity to mean the capacity calculated with the charge cut-off voltage set at 4.25 -- 4.2 volts; correct?

A. Can you say again?

Q. You told the district court that the patent defines theoretic capacity of the positive electrode to mean the capacity of the positive electrode calculated with the charge cut-off voltage set at 4.2 volts; correct?

A. Yes.

Q. You didn't tell the court that the patent defines theoretic capacity to mean the theoretic capacity of the positive electrode calculated with the charge cut-off voltage set at 4.2 volts; correct?

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A. Is there any difference? Just two -- I didn't see the difference. Can you repeat the question?

Q. You didn't tell the district court that the '641 patent defines the term "theoretic capacity" to include the word "theoretic"; correct?

MR. STAMATOPOULOS: Object to form.

A. From the context we can understand the capacity should refer to theoretic capacity. Yes. It's not -- we didn't have that word in the claim construction, but from the context of the claim construction, we understand that it's theoretic capacity.

Q. You specifically argued to the court that "theoretic" should not be included in the construction; correct?

A. No. That's not correct.

Q. All right. Turn to your second Apple declaration, which we marked earlier in this deposition as Exhibit 1036, in paragraph 9.

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So you told the court, "Dr. Horn state that he disagrees that theoretic capacity should be construed as capacity"; correct?

A. Yes.

Q. So Apple wanted the term "theoretic" in the construction; correct?

MR. STAMATOPOULOS: Object to form.

A. Yes. And I have no objection on that.

Q. (BY MR. COLIN) Well, here you told the court, "But the '641 patent says the opposite, that theoretical capacities of positive electrode and negative electrode means the capacities" -- and "the capacities" is bold italicized -- "of the positive electrode and the negative electrode calculated with a charge cut-off voltage set at 4.2 volts"; correct?

A. Yes.

Q. So you argued in that sentence that the '641 patent specifically says "theoretic" should not be included in the construction; correct?

MR. STAMATOPOULOS: Object to

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form.
A. That's not -- that's wrong. As -- as I said, need to be calculate with the charge cut-off voltage at 4.2 -- set at 4.2 volt. If it's not theoretic capacity, I wouldn't -- cannot imagine how you can calculate. So, therefore, this is referring to theoretic capacity.
Q. So is it your opinion that if this is not limited to theoretic capacity, that a person of ordinary skill would not understand how to calculate --
A. A POSA -- POSA at that time would understand, in order to calculate the capacity only electrode, you would use the theoretic capacity and the mass of the actual material to do the calculation.
Q. The portion of the patent spec which you said defines theoretic capacity does not include the word "theoretic"; correct?
MR. STAMATOPOULOS: Object to form.
A. Can you repeat the question?

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Q. (BY MR. COLIN) When you told the court in paragraph 9 that the patent says the opposite, you told the court that "theoretical capacities" of the positive electrode and negative electrode means "the capacities"; correct?
MR. STAMATOPOULOS: Object to form.
A. "The capacity" here is a general term. It didn't distinguish. But I think it's referring to theoretic capacity.
Q. (BY MR. COLIN) Theoretic capacity is a type of capacity; correct?
A. Yes.
Q. Practical specific capacity is a type of capacity?
A. That's correct.
Q. But in your analysis, a practical specific capacity does not meet the court's claim construction; correct?
MR. STAMATOPOULOS: Object to form.
A. You are correct.

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Q. (BY MR. COLIN) In paragraph 103 of your IPR declaration, you indicate that inactive materials do not participate in intercalation and de-intercalation; correct?
A. Which paragraph?
Q. Paragraph 103.
A. That's correct.
Q. So you agree with me that inactive components do not have capacity; correct?
A. They do not contribute to reversible capacity; that's correct
Q. Is it your opinion that inactive components contribute to irreversible capacity?
MR. STAMATOPOULOS: Object to form.
A. Yes.
Q. (BY MR. COLIN) By definition, if you're saying an inactive component contributes to irreversible capacity, isn't that then participating in intercalation and de-intercalation?
MR. STAMATOPOULOS: Object to

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form.
A. Yeah. Inactive material does not participate in intercalation and de-intercalation. At least not in the reversible fashion.
Q. (BY MR. COLIN) So it's your opinion that inactive components contribute to irreversible capacity?
A. Inactive -- inactive material does not contribute to reversible capacity.
Q. That's not my question, sir. My question is, it's your opinion or you're telling the board is that inactive materials will react with lithium and contribute to irreversible capacity?
MR. STAMATOPOULOS: Object to form.
A. Are you saying irreversible capacity? Yes.
Q. (BY MR. COLIN) You don't cite any reference, any literature, anything to support that opinion; correct?
A. That's what I teach in my class. That's common knowledge to the POSA.

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Q. If you turn to your first Apple IPR declaration. It's in Exhibit 2022 at paragraph 53.

A. Yes.

Q. You previously stated that there are active components and inactive components; correct?

A. I see I have active components here in the paragraph 53. Where do I say inactive components?

Q. "Inert" means inactive; correct?

A. Say it again.

Q. "Inert" means inactive?

MR. STAMATOPOULOS: Object to form.

A. Inert, as in here, include inactive, but not only -- yeah, inert components include inactive components.

Q. (BY MR. COLIN) Okay. And you stated "inert components perform necessary nonreaction functions"; correct?

A. That's correct.

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Q. In paragraph 105 of your declaration for the IPR, you refer to an X value, correct? "X" in quotations.

A. That's correct.

Q. Okay. And you call that a lithium extraction coefficient?

A. To be more accurate, is the number of lithium ions extracted from lithium cobalt per formula unit, of lithium cobalt --

Q. Okay. Do you call the X number anything else, or if I just say X value, that's how you refer to it?

A. Yes.

Q. Okay. So the '641 patent does not refer to any X value; correct?

A. That's not correct.

Q. Show me in your declaration where you point out the '641 patent showing an X value.

MR. STAMATOPOULOS: Object to form.

A. So in paragraph 109, I said, "Lithium cobalt oxide 4.2 volts, it's known that half of

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the lithium ions that material extracted from the cathode, X equals .5, and so the theoretic capacity of 4.2 volts," which is the claim of Claim 5 of the '641 patent for lithium cobalt oxide 137 milliamp-hours. So X is .5 for -- when the theoretic capacity of 4.2 volts, which is in Claim 5.

Q. (BY MR. COLIN) Dr. Yao, that didn't answer my question at all. I said show me at all where in your declaration you cite the '641 patent as demonstrating an X value.

A. I think that's referring the same thing here. In paragraph 109, lithium cobalt oxide 4.2 volt is X .5. It's the same thing we're referring to in the '641 patent.

Q. Doctor --

A. We didn't cite. We didn't cite. But, you know, that's -- we didn't have to cite, I think.

Q. You cannot cite anything in the '641 patent that describes an X value; correct?

A. So in the '641 patent, column 1, the

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bottom, I think the sentence lines 66-67. So they refer to the -- to lithium cobalt oxide that is used as positive electrode material in the most commercial lithium ion batteries, the charge cut-off voltage limited to below 4.2 volts and the actual capacity 120 to 140 milliamp-hour per gram, i.e., about 50 percent of theoretic capacity.

So from here the description is about, you know, 120 to 140. I think that's referring to 137 milliamp-hour one, which described in paragraph 109 of my declaration. And the 50 percent actually indicated X equals .5 as the X value here.

Q. Dr. Yao, you testified earlier today that that same portion of the spec is referring to an actual capacity of 120 to 140 milliamp-hours per gram, not a theoretic capacity of 4.2 volts; correct?

A. Yes.

Q. Okay. Dr. Yao, how did it become well known that half of the lithium atoms are extracted from the cathode at 4.2 volts?

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MR. STAMATOPOULOS: Object to form.

A. I think people perform experiments, charge the battery to 4.2 volts lithium cobalt oxide, and they can measure how much missing retaining the cathode actual material. Then from experimental they discovered this charge cut-off voltage at 4.2 volt is about 50 percent lithium extracted and 50 percent lithium remaining in the cathode material.

Q. (BY MR. COLIN) Okay. So experiments need to be performed to derive an X factor; correct?

MR. STAMATOPOULOS: Object to form.

A. People reporting in the literature, and it's become accepted knowledge in the field. You don't need to repeat every time. It's become knowledge. Yeah.

Q. (BY MR. COLIN) Okay. X is not determined based on some calculation; correct? It's based on people in the field performing

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experiments?

MR. STAMATOPOULOS: Object to form.

A. Yes.

Q. (BY MR. COLIN) Okay. And you can't tell me an X value for an unknown material; correct? If you develop a new cathode material, brand-new material, you can't just tell me an X factor without doing the experiments; correct?

A. You are correct.

Q. And for -- if you create a material that is doped, you can't figure out an X factor without doing the experiments; correct?

MR. STAMATOPOULOS: Object to form.

A. You need do experiment. But some people write down the experiment, you can rely on their data to predict.

MR. STAMATOPOULOS: Not to interrupt you, Jeff, but we've been going for about an hour and a half. I don't know if it's a good time for a break, but --

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MR. COLIN: Sure.

MR. STAMATOPOULOS: -- whenever you feel --

MR. COLIN: Let's go off the record.

THE VIDEOGRAPHER: Off the record at 2:28 p.m.

(Recess from 2:28 p.m. to 2:40 p.m.)

THE VIDEOGRAPHER: The time is 2:40 p.m., and we're back on the record.

Q. (BY MR. COLIN) Dr. Yao, you received your bachelor's degree in 2000?

A. That's correct.

Q. Okay. And you completed your master's degree in 2003?

A. Correct.

Q. Okay. When did you start working with lithium ion batteries?

A. I started working on lithium ion batteries in 2010 at Stanford University.

Q. Okay. So in paragraph 6 of your declaration, when you say "more than 13 years I've

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conducted research on lithium ion batteries and then taught students about lithium ion batteries for over a decade," that work started in 2010?

A. I started as assistant professor was 2012. But I started working on lithium batteries starting 2010.

Q. Okay. So you were not a person of ordinary skill in the art as of September 2001; correct?

A. I think I more than a person -- POSA.

Q. I think my -- my question is a little bit different than that, Dr. Yao. You were not a person of ordinary skill in the art in September 2001; correct? At that time you did not have qualifications of a POSITA?

A. That's correct.

Q. Okay. If you turn to paragraph 64 of your declaration.

A. Yes.

Q. In paragraph 64, you note that Uemura teaches that lithium cobalt oxide is unstable under an environment where a battery is operated,

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citing Uemura at paragraph 6; correct?
A. Correct.
Q. You provide no analysis in your declaration concerning the fact that if Uemura only taught a charge cut-off voltage of 4.2 volts or less, how lithium cobalt oxide is unstable under that environment; correct?
A. Can you repeat the question?
Q. Sure. You provide no analysis in your declaration concerning the fact that if Uemura only taught a charge cut-off voltage of 4.2 volts or less, how lithium cobalt oxide is unstable in that environment; correct?
MR. STAMATOPOULOS: Object to form.
A. I think Uemura has many type and different type of cathode material called layer lithium manganese oxide. But your question is on lithium cobalt oxide?
Q. (BY MR. COLIN) Right. My question is: You cite Uemura as teaching that lithium cobalt oxide is unstable under an environment where the

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battery is operated, but you provide no analysis in your declaration concerning the fact that if Uemura only taught a charge cut-off voltage of 4.2 volts or less, about how lithium cobalt oxide is unstable in that environment.
MR. STAMATOPOULOS: Object to form.
A. Yeah. Your question is very complicated. I think, you know, we already, not in this location, but in other location in my declaration I have talk about, you know, charging 4.2 volt for lithium cobalt oxide can cause, you know, negative consequence to the cathode material.
Q. (BY MR. COLIN) I understand that. But it's your opinion that Uemura teaches -- does not teach a charge cut-off voltage above 4.2 volts; correct?
A. Is my -- you are correct.
Q. All right. So my question is, if Uemura does not teach a charge cut-off voltage above 4.2 volts, you provide no analysis in your declaration concerning the fact that lithium cobalt oxide is

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unstable under Uemura's conditions; correct?
MR. STAMATOPOULOS: Object to form.
A. In -- on page 27 of the declaration on the -- on the paragraph 64, I didn't provide my opinion on lithium cobalt oxide. What I here described as Uemura working on to improve lithium cobalt oxide based material layered structure that has much higher capacity than the conventional lithium cobalt oxide based material.
Q. (BY MR. COLIN) Dr. Yao, you cite the paragraph in Uemura where he says he uses lithium manganese oxide instead of lithium cobalt oxide because lithium cobalt oxide is unstable under the environment where the battery is operated; correct?
A. Yes. Lithium cobalt oxide is not stable above 4.2 volt.
Q. And that's why Uemura uses lithium manganese oxide; correct?
A. That's the motivation.
MR. STAMATOPOULOS: Object -- I'm

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sorry, but I need to --
MR. COLIN: He already answered, Counsel.
MR. STAMATOPOULOS: Okay. That's your view --
MR. COLIN: It's not a view. He's already done answering, Counsel.
MR. STAMATOPOULOS: I'll make my objection for the record --
MR. COLIN: It's not for the record because it's already after his answer.
MR. STAMATOPOULOS: All right. Okay.
MR. COLIN: If you don't like what he says, you can't just object.
MR. STAMATOPOULOS: I have no problem with what he said. I just want to make sure that I have the time to put in my objections. If you don't mind giving me a second before starting your answer, can put in my objections. In any event, we don't disagree --
MR. COLIN: We don't need

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speaking objections, Counsel. This is entirely improper.
MR. STAMATOPOULOS: Okay.
MR. COLIN: You're using up my time. You're using up the record. You could have a one-word objection before he responds. He already responded.
MR. STAMATOPOULOS: Please --
Q. (BY MR. COLIN) Dr. Yao, in paragraph 65 of your declaration, you cite to Kajiyama; correct?
Let me be more specific. In footnote 15 to paragraph 65 of your declaration you cite to Kajiyama; correct?
A. That's correct.
MR. COLIN: So let's introduce what's already been marked as Exhibit 2017, which is the Kajiyama reference cited in footnote 15.
Q. (BY MR. COLIN) Dr. Yao, in the abstract, Kajiyama indicates that layered lithium cobalt manganese oxide showed a potential of 4.5 volts relative to lithium; correct?

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MR. STAMATOPOULOS: Object to form.
A. That's correct.
Q. (BY MR. COLIN) And Kajiyama goes on in the abstract to note that the electrode potential of lithium cobalt manganese oxide is higher than the potential for lithium cobalt oxide and lithium manganese oxide; correct?
MR. STAMATOPOULOS: Object to form.
A. That's correct.
Q. (BY MR. COLIN) And Kajiyama furthers goes on in that same sentence to say "and lower than the 5.0 volt of spinel-type lithium cobalt manganese oxide; correct?
MR. STAMATOPOULOS: Object to form.
A. That's correct.
Q. (BY MR. COLIN) And if you go to the last sentence of section 2.2 in Kajiyama, Kajiyama teaches that the cell was charged and discharged at a constant current of 0.1 milliamps at room

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temperature at voltage range between 3.5 and 5.2 volts; correct?
MR. STAMATOPOULOS: Object to form.
A. That's what it say in this paper.
Q. (BY MR. COLIN) Okay. So this paper that you cite in your IPR declaration discloses charging lithium cobalt manganese oxide in a voltage range between 3.5 and 5.2 volts; correct?
MR. STAMATOPOULOS: Object to form.
A. Yeah. This is what it says. But this 5.2 volts is not the charge cut-off voltage that's defined in the claim of '641 patent.
Q. (BY MR. COLIN) So it's your position that Kajiyama's disclosure of charging and discharging at a constant current of 0.1 milliamps between a voltage range from 3.5 to 5.2 volts doesn't disclose a charge cut-off limitation above 4.2 volts?
MR. STAMATOPOULOS: Object to form.

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A. Correct. It didn't disclose. This apply -- this apply voltage, 5.2 volts. Is not clear what the battery's voltage or the charge cut-off voltage at equilibrium is not clear. So that's why it's different.
Q. (BY MR. COLIN) So your testimony to the board is the reference that discloses charging a material up to 5.2 volts doesn't disclose a charge cut-off voltage above 4.2 volts?
MR. STAMATOPOULOS: Object to form.
A. You can apply any charge -- charge voltage as high as 5.2 volt. What you need to show is that at equivalent equilibrium what's the voltage -- what's the better voltage, which, as you note from this discussion, is not clear.
Q. (BY MR. COLIN) So in your opinion, Kajiyama does not teach that it was well known to charge compounds containing manganese to voltages well above 4.5 volts?
MR. STAMATOPOULOS: Object to form.

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A. Can you repeat your question?
Q. (BY MR. COLIN) In your opinion, Kajiyama does not teach that it was well known to charge compounds containing manganese, such as lithium cobalt manganese oxide, to voltages well above 4.5 volts?
MR. STAMATOPOULOS: Same objection.
A. I don't think I was asked to form opinion on this, you know, reference. You know, I have spent my time on other reference. So this was not the reference I was asked to consider these questions. So...
Q. (BY MR. COLIN) So, Dr. Yao, sitting here today you have no opinion on whether a reference that teaches charging lithium cobalt manganese oxide at a constant current of 0.1 milliamps at a voltage range between 3.5 and 5.2 volts meets the 4.2 volt charge cut-off limitation of the patent?
MR. STAMATOPOULOS: Object to form.
A. As I sit here today, I -- I don't think I

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can form an opinion on this question because, you know, there's many factors need to be considered. For example, the full-cell voltage is what is -- what a C-rate of this .1 milliamp. And that -- I need more information and time to read and understand this.
Q. (BY MR. COLIN) So are you telling me without a C-rate, you can't determine a charge cut-off voltage being above 4.2 volts?
MR. STAMATOPOULOS: Object to form.
A. Yeah, we need to know the C-rate, we need to know the anode material, we need to know the -- you know, the ratio between, you know, anode and the cathode. I think with that -- those information, I can answer your question.
Q. (BY MR. COLIN) So sitting here today, looking at Kajiyama, a reference you rely on in your declaration, you can't tell me whether it discloses a charge cut-off voltage above 4.2 volts when it indicates that the cell was charged in a voltage range at a constant current between 3.5

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and 5.2 volts?
MR. STAMATOPOULOS: Object to form.
A. Yes, I do cite this reference 15 in my declaration. That's mainly to state that in the 1990s we are research groups have attempt to synthesize lithium manganese oxide but have failed. It's not used to support the voltage, cut-off voltage point.
MR. COLIN: Dr. Yao, that was completely nonresponsive to my question. I move to strike again. And I'll ask you the same question.
Q. (BY MR. COLIN) Sitting here today, looking at Kajiyama, a reference which you rely on in your declaration -- this is not the first time you've seen it -- you can't tell me whether it discloses a charge cut-off voltage above 4.2 volts when it indicates that a cell containing lithium cobalt manganese oxide was charged in a voltage range at a constant current of 0.1 milliamps in a range between 3.5 and 5.2 volts?

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MR. STAMATOPOULOS: Object to form.
A. As I sit here today, I'm not ready to offer opinion on this because many information is not complete. The C-rate, the anode material, and the charging protocols is not presented here.
Q. (BY MR. COLIN) So you're telling me you can't determine whether a reference teaches the charge cut-off voltage if it doesn't provide the C-rate, the anode material, and the other information you just included in your response?
MR. STAMATOPOULOS: Object to form.
A. Yeah, that's correct.
Q. (BY MR. COLIN) The Kajiyama reference you cite cites to another Kajiyama reference cited in reference number 9 at the back of it; correct?
A. I did not understand your question.
Q. Well, I will state it to you. Kajiyama, the reference we're looking at today right here in front of you --
A. Okay.

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Q. -- so Exhibit 2017, cites to another Kajiyama reference as footnote number 9; correct? Footnote number 9.

A. Okay.

Q. Can you see that there in front of you, that it cites to another Kajiyama reference from 2001?

A. Yes.

Q. Okay.

A. Is on the reference side.

Q. So it's introduced as the next exhibit, Exhibit 1040, the Kajiyama 2001 reference cited in the other Kajiyama reference.

MR. STAMATOPOULOS: What's the number of this?

MR. COLIN: This is 1040.

(Exhibit 1040 marked)

Q. (BY MR. COLIN) Dr. Yao, this article by Kajiyama is entitled, "Layered Lithium Cobalt Manganese Oxide as a High-Voltage Positive Electrode Material for Lithium Batteries"; correct?

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A. Yes.

Q. Okay. And this was a manuscript that was submitted in July 3rd, 2000, available electronically August 2nd, 2001; correct?

MR. STAMATOPOULOS: Object to form.

A. Yes, that's correct.

Q. (BY MR. COLIN) In the abstract, Kajiyama indicates charging the lithium cobalt manganese oxide material at a potential of 4.5 volts relative to lithium; correct?

MR. STAMATOPOULOS: Object to form.

A. Did I cite this in my declaration?

Q. (BY MR. COLIN) It's cited in the Kajiyama reference you rely on.

A. Okay. So is this a reference of the reference? Yeah, I have not reviewed this previously. And I would need some time to read the reference.

Q. If you look at the end the "Experimental" section, Kajiyama indicates that "the cell was

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charged and discharged at a constant current of 0.1 milliamps at room temperature. The applied voltage was varied between 3.5 and 5.2 volts." Do you see that?

A. I see that.

Q. Okay. And, again, you could not tell me without additional information whether this reference would teach the charge cut-off voltage limitation of the patent?

MR. STAMATOPOULOS: Object to form, scope.

A. Yeah, I cannot form an opinion on -- on the -- on this matter.

Q. (BY MR. COLIN) And if you look at the first column of Kajiyama, two paragraphs up from the "Experimental," it says, "Recently some high-voltage positive electrode materials with operating voltages over 4.5 volts versus lithium have been investigated"; correct? Do you see that?

MR. STAMATOPOULOS: Object to form.

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A. Which paragraph? I can't find --

Q. (BY MR. COLIN) It's in the first column right here.

A. Okay.

Q. Starting with "Recently."

A. Hm-hm.

Q. Do you see that?

A. Yes.

Q. Okay. It refers to "Recently, some high-voltage positive electrode materials with operating voltages over 4.5 volts relative to lithium have been investigated," and it cites seven different references; correct? Footnotes 18 to 24.

MR. STAMATOPOULOS: Object to form.

A. Yes.

Q. (BY MR. COLIN) Okay. And it goes on to state, "Most of the positive electrodes have a spinel structure in which manganese ions are partially replaced with other transition metal ions in the spinel lithium manganese oxide";

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correct?
A. Correct.
Q. Okay. And it says, "As far as we know, high-voltage positive electrode materials having a layered structure have not been reported." That's one of the things that you rely on the later Kajiyama reference for; correct?
MR. STAMATOPOULOS: Object to form.
A. Yeah, I didn't rely on this reference. I was relying on, you know, 2017 reference.
Q. (BY MR. COLIN) If you go to the conclusion of this reference, in the last sentence it says, "The high-potential was promising for a new positive electrode material in lithium ion batteries"; correct?
A. Yes.
Q. Okay. But it's your position, where you tell the board that it was not known prior to September 2001 to charge batteries, cathode materials up to more than 2 -- 4.2 volts?
MR. STAMATOPOULOS: Object to

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form.
A. So this reference here using this metal as the reference, the actual. So this is what was -- you know, in my declaration, what paragraph -- 192 as -- as said, the POSITA would understand that the claim cut-off voltage refers to the full-cell voltage, not to the half-cell voltage. So in this reference I would not be able to know the full-cell voltage. That's number one. Number two is also the C-rate is not clear. We are referring to cut-off voltage as at equilibrium. Here only use a constant current, constant current charging. So we don't know what's varied voltage at equilibrium. So apply the voltage can reach 4.5 volt, but there's no way I can know what's charge cut-off voltage of this reference.
Q. (BY MR. COLIN) And you tell the board, don't you, that a person of ordinary skill would not be motivated to charge a spinel cathode above 4.2 volts; correct?
A. Yes.

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Q. Okay. But Kajiyama, the reference you rely on, and this Kajiyama both disclose charging doped lithium cobalt manganese oxide materials all the way up to 5.2 volts; correct?
MR. STAMATOPOULOS: Object --
A. Just mentioned --
MR. STAMATOPOULOS: Object. Object to form.
A. Mention this is a spinel case in the earlier question. But this reference and the Kajiyama reference was cited layered manganese oxide. It's different phase, different cathode material.
Q. (BY MR. COLIN) Yeah. But you read the reference to Kajiyama before where it says "Recently some high-voltage positive electrode materials with operating voltages over 4.5 volts of lithium have been investigated," and then cites references 18 to 24. "Most of the positive electrodes have a spinel structure in which manganese ions are partially replaced with other transition metal ions in the spinel."

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In view of these references, it's still your opinion to the board that a person of ordinary skill would not be motivated to charge a spinel electrode above 4.2 volts?
MR. STAMATOPOULOS: Object to form, scope.
A. There's a reference in the second page it said, "XRD pattern of the Figure 1b was obtained for the layered oxide ion-exchanged with lithium." So, this -- you know, this indicates this is a layered oxide. This layer oxide phase, not spinel phase. So, you know, I -- so, yeah, so I hope you understand that this is a different phase compared to the Guyomard patent we discussed earlier.
Q. (BY MR. COLIN) Okay. So is it your opinion based on your own explanation that Kajiyama teaches charging lithium cobalt manganese oxide with a layered structure all the way up to 5.2 volts?
A. No. I already explained earlier why it's not the case.

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Q. Okay. In paragraph 65 of your IPR declaration, you also cite to an Armstrong reference.
A. Yes.
MR. COLIN: Let's introduce what's already been marked as Exhibit 2009.
Q. (BY MR. COLIN) And this is the Armstrong 1996 reference cited in your declaration; correct?
A. That's correct.
Q. Okay. And you rely on this reference?
A. Yes.
Q. If you turn to second page of it, Figure 3 at the top, "Armstrong cycled a lithium manganese dioxide from 3.4 volts to 4.3 volts relative to lithium"; correct?
MR. STAMATOPOULOS: Object to form.
A. Yes.
Q. (BY MR. COLIN) Armstrong used a constant current of 0.5 milliamps per centimeter squared for the testing shown in Figure 3; correct?
MR. STAMATOPOULOS: Object to

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form.
Q. (BY MR. COLIN) The value is right in the Figure 3 label.
A. Yes.
Q. In the first full paragraph on page 500 of Armstrong -- so it's the second page, just so I can show you this -- this paragraph.
MR. STAMATOPOULOS: The ones that starts with "interest"?
MR. COLIN: "Interest." Correct.
Q. (BY MR. COLIN) So you rely on the fact that Armstrong provides an initial measured capacity of 270 milliamps-hour per gram; correct?
MR. STAMATOPOULOS: Object to form.
A. Can you point to where I rely on this number?
Q. (BY MR. COLIN) Sure. So paragraph 134. You say at the last sentence, "Because the '641 patent requires the use of theoretical capacity of 4.2 volts for calculating the claimed ratio, 270 milliamp-hours per gram is more appropriate to use

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than Uemura's 180 milliamp-hours per gram, and you cite to Figure 2 of Armstrong. Correct?
A. That's correct.
Q. Okay. So going back to Armstrong to talk about this 270 milliamp-hour. So Armstrong indicates that the material has an initial measured capacity of 270 milliamps-hour per gram; correct?
A. That's correct.
Q. And that's an experimentally measured number; correct?
MR. STAMATOPOULOS: Object to form.
A. Yes.
Q. (BY MR. COLIN) Okay. And so Armstrong derives the 270 milliamp-hour per gram number by applying a charging current density of 10 milliamps per centimeter squared; correct?
MR. STAMATOPOULOS: Object to form.
A. It says 10 microamp per centimeter square, which is several times more than what you

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just mentioned.
Q. (BY MR. COLIN) Okay. Thank you for that correction. So, just to be clear, the 270 milliamp-hour per gram value of Armstrong is experimentally determined using a 10 microamp per centimeter squared current density?
MR. STAMATOPOULOS: Object to form.
A. That's correct. Yeah. It's very slow charging.
Q. (BY MR. COLIN) Okay. Then Armstrong goes on to say in the next sentence, "Preliminary measurements at the much higher current density of 0.5 milliamps per centimeter squared suggests that a capacity approaching 200 milliamp-hours per gram may be obtained up to a cut-off potential of 4.3 volts"; correct?
MR. STAMATOPOULOS: Object to form.
A. It's what is written in this paper.
Q. (BY MR. COLIN) Okay. So Armstrong teaches that the reversible capacity of the

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lithium manganese oxide approaches 200 milliamp-hours per gram when you use a cut-off potential of 4.3 volts?

A. That's incorrect. First, it didn't say the reversible capacity. It just said the capacity approaching 200. In fact, from Figure 3, it's clear it's not reversible. The capacity decay very fast in the second and later cycles.

Second -- yeah, second, the cut-off voltage potential here of 4.3 volt is half-cell voltage is different from the full-cell voltage referring to '641.

Q. (BY MR. COLIN) Okay. So the 270 milliamp-hour per gram and the 200 milliamp-hour per gram values were obtained using half cells with cut-off potentials of 4.3 volts?

MR. STAMATOPOULOS: Object to form.

A. So, you know, as was written the footnote, you know, in my declaration, 84. So I said that based on Figure 2 of Armstrong, 1996, the theoretic battery cell layered lithium oxide

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of 4.2 volt likely exceeds 270 million ampere per gram of battery or achieve a specific capacity of 270 milliampere per gram at approximately 4.1 volt. So that's why I just use this number, which is as a theoretic capacity at the 4.2 in my calculation.

Q. (BY MR. COLIN) Well, the theoretic maximum capacity of that material is 285 milliamp-hours per gram; right?

MR. STAMATOPOULOS: Object to form.

A. I think that's correct.

Q. (BY MR. COLIN) Okay. So your opinion in paragraph 84 is that the theoretical capacity of layered lithium manganese oxide at 4.2 volts likely exceeds 270 milliamp-hours per gram; correct?

MR. STAMATOPOULOS: Object to form.

A. Yeah, but it's very close to this number.

Q. (BY MR. COLIN) Okay. So you believe that the theoretic capacity of 4.2 volts likely --

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I mean is within experimental error of the maximum theoretic capacity; correct?

MR. STAMATOPOULOS: Objection. Form.

A. The maximum theoretic capacity is 285, as you mentioned. Here, you know, I think it's close. 270 -- it's around 270 milliamp per hour --

Q. (BY MR. COLIN) And so why did you pick 270 milliamp-hours per gram as the theoretic capacity at 4.2 volts of lithium manganese oxide as opposed to 200 milliamp-hour per gram that's obtained using a faster current?

MR. STAMATOPOULOS: Object to form.

A. Yeah. The reason I picked the specific capacity at a lower current density, 10 microamp per centimeter squared, it's more close equilibrium. And that's more close to the -- that's a number typical we use to consider as capacity, as a theoretic capacity value.

As I explained to you earlier, you know,

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that's how experimentally, you know, determine the theoretic capacity and know the X, you know, extraction ratio, typically at a very slow rate. 25 milliamp per centimeter is much higher rate. It's not considered close to equilibrium current capacity.

Q. (BY MR. COLIN) So if you charge something as slowly as possible, you obtain more capacity, correct? --

MR. STAMATOPOULOS: Object to form.

Q. (BY MR. COLIN) -- at a certain voltage?

A. When you charge a battery as slow as possible, you can get the practical capacity as close to the theoretic capacity that's close, much -- you know, you have more agreement with the two terms.

Q. And so Armstrong demonstrates that just changing the current -- charging current, you could obtain capacities of 200 or 270 milliamp-hours per gram; right?

MR. STAMATOPOULOS: Object to

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form.
A. Can you repeat your question? I didn't understand --
Q. (BY MR. COLIN) Yeah. Armstrong teaches that, depending what current he applies, he either obtains a initial capacity of 270 milliamp-hours per gram or initial capacity of 200 milliamp-hours per gram; correct?
MR. STAMATOPOULOS: Same objection.
A. That's what it shows, yes.
Q. (BY MR. COLIN) In the last paragraph of Armstrong where it starts with "Some preliminary cycling data" -- do you see that?
A. Yes.
Q. Okay. In the second sentence Armstrong indicates, "Previous studies using cyclic voltometry indicated that the electrolyte was stable in contact with this electrode up to at least 4.4 volts"; correct?
A. That's what is written, yes.
Q. And it's your opinion sitting here today

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that this reference, which teaches two different charging currents and charging the lithium manganese layered oxide material up to 4.4 volts, does not teach the charge cut-off voltage of the claims?
MR. STAMATOPOULOS: Object to form.
A. No, it didn't teach. Here it specifically says the electrolyte was stable in contact with up to 4.4. It didn't say the battery voltage at the equilibrium at end of the charge is 4.4 volt.
Q. Right. So Armstrong took a half cell with its cathode of layered lithium manganese oxide, an electrode, charged it up to 4.4 volts relative to lithium, and found that the electrolyte was stable at that voltage; correct?
A. See, the electrolyte is stable as a voltage; but we are talking about electrode. It didn't say anything on electrode in this paragraph.
Q. So in your opinion reference needs to

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teach what's going on at the cathode to determine whether it meets the charge cut-off limitation?
MR. STAMATOPOULOS: Object to form.
A. It's full cell. According to '641 claim, it's different between the cathode and the anode potential need to reach 4.2 volt.
Q. Okay. In paragraph 67 of your declaration, you indicate that Armstrong 1996 does not disclose a battery voltage of 4.2 volts where a full-cell voltage of 4.2 volts, only an applied voltage of 4.3 volts relative to lithium metal; correct?
A. Which paragraph?
Q. 67. Starts at the bottom of page 30 and goes on to the top of page 31.
A. That's correct.
Q. Okay. So even though Armstrong does not disclose a battery voltage of 4.2 volts or a full-cell voltage of 4.2 volts, only an applied voltage of 4.3 volts relative to lithium metal, you apply the Armstrong value as a theoretical

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specific capacity from lithium manganese oxide at 4.2 volts; correct?
MR. STAMATOPOULOS: Object to form.
A. Yes. There's two separate things. One, charge cathode voltage of the full cell. The other is capacity ratio. When we use the capacity ratio calculation, we consider half-cell capacity relevant to this metal. So that's why we can use this 270 milliamp-hour capacity as a theoretic capacity so there's no inconsistency here.
Q. (BY MR. COLIN) Well, you said the theoretic capacity of 4.2 volts under your proposed construction does not include measured capacity; correct?
MR. STAMATOPOULOS: Object to form.
A. As I explained to you, the measured capacity at close to equilibrium condition can be used to construct the theoretic capacity X value. So, yeah, the same -- you know, very close number, materially the same number.

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Q. (BY MR. COLIN) So now your opinion to the board is that, depending on the charging value, a measured capacity may be a theoretic capacity?

MR. STAMATOPOULOS: Object to form.

A. The theoretic capacity and the measured capacity, at a certain condition the value could be the same. Right? That's the reason you have theoretic capacity, to guide the design. So if the measured practical capacity is far away from the theoretic capacity, what's the point of the theoretic capacity?

So there are two different numbers, terms, but at certain condition you could have the same value. So it's fully consistent with what I had described previously.

Q. (BY MR. COLIN) You use the 270 milliamp-hour per gram as a theoretic capacity for doped materials in Uemura, even though you admit that doping affects capacity; correct?

MR. STAMATOPOULOS: Object to

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form.

A. Can you point to where I state that in my declaration?

Q. (BY MR. COLIN) You don't know where in your declaration you state doping affects capacity?

MR. STAMATOPOULOS: Object to form.

A. I know. I just want to be more specific.

Q. (BY MR. COLIN) I believe it's somewhere in the 190s.

A. Yeah. Several places I talk about that.

MR. STAMATOPOULOS: Is this like a memory test?

A. Some -- so let me...

Q. (BY MR. COLIN) It's in the 170s. Let me just ask you the question.

You agree with me that doping affects capacity; correct?

MR. STAMATOPOULOS: Object to form.

A. As a general matter, that's true.

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Q. (BY MR. COLIN) Yet you apply what you call a theoretic specific capacity of 4.2 volts for lithium manganese oxide as a theoretic capacity of 4.2 volts for various doped versions of lithium manganese oxide?

MR. STAMATOPOULOS: Object to form.

A. If you're referring to -- referring to the paragraph 136, what I state here is that "Following Uemura's approach in ascertaining the specific capacity of each of the 17 examples, I calculated the theoretical capacity at 4.2 volts of these cathode materials based on the equation below: Theoretical specific capacity at 4.2 volts equals 270 milliamp-hours per gram."

Also I have a note, 86, here. So "it would be apparent to a POSA this data were not genuine experimental data because they do not have any degree of error, which is impossible in the field of electrochemistry. They are also inconsistent with what is reported in the literature."

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So basically I used 270, I just follow Uemura's approach. In fact, later -- in later section we did calculate for -- considering the difference of tokens in the later tables.

Q. (BY MR. COLIN) Dr. Yao, you took the amount of lithium in each of the 17 examples in -- in Uemura and just multiplied them by 270. It didn't matter that some were lithium manganese cobalt oxide, some were lithium manganese iron oxide, some were lithium manganese aluminum oxide, you, in your analysis of what the specific capacity or the theoretical capacity of 4.2 volts is, simply applied all those dope materials by 270 milliamp-hours per gram; correct?

MR. STAMATOPOULOS: Object to the form.

Q. (BY MR. COLIN) That's what you did in paragraph 137.

MR. STAMATOPOULOS: Same objection.

A. Yeah. So I have a two-part answer to your question. First, page 67 of my IPR I list a

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table which shows the specific capacity calculated based on Uemura's reported data. So you can see all this data, last column, follows a trend which is they use 180 milliamp hour plan times this amount. So what that describes in the paragraph 136 is follow the same approach that's used in Uemura's approach in this first part.

Second part in my -- in page 87, paragraph 171, I have a table to list the theoretic maximum capacity which calculates considering that doping molecular weight difference. So that's here in this, you know, table in page 87 and 88. That shows the theoretical maximum capacity value.

Q. (BY MR. COLIN) Dr. Yao, in paragraph 137, you apply what you call the correct approach for deriving the theoretic capacity at 4.2 volts; correct? And that's to multiply the amount of lithium by 270 milliamp-hours per gram?

A. That's correct.

Q. Okay. And so your approach ignored that examples 1 to 17 have different compositions;

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right?

MR. STAMATOPOULOS: Object to form.

A. In the page 88 and 89 I have that correct value laid out in the table for maximum theoretic capacity.

Q. (BY MR. COLIN) Dr. Yao, the theoretic maximum capacity is not what the claims are directed to; correct?

MR. STAMATOPOULOS: Object to form.

A. That's correct.

Q. (BY MR. COLIN) You tell the board in paragraph 136 and 137 of your declaration that the way you determine the theoretic capacity at 4.2 volts is you just multiply the amount of lithium, the molar amount of lithium by 270 regardless of the exact composition of the cathode material; correct? You tell the board that that's the proper analysis --

MR. STAMATOPOULOS: Object to form.

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Q. (BY MR. COLIN) -- under the claim construction.

MR. STAMATOPOULOS: Object to form.

A. Yeah. This is a relatively simple approach, the best estimate I can have. Basically I follow the same methodology that's Uemura's approach that I show here in paragraph 137 -- 36, he use 180; I use 270 as in -- 270 is a better value. You know, but because 17 materials used I think that's the best approach we can to approximate --

Q. (BY MR. COLIN) Let me ask you about that, then. It's your opinion that as you -- you've said a few times you believe that Uemura just multiplied the amount of lithium by 180 milliamp-hours per gram in Figure 3; correct? That's how he got his values?

MR. STAMATOPOULOS: Object to form.

Q. (BY MR. COLIN) That's what you say in paragraph 165 and 166.

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MR. STAMATOPOULOS: Object to form.

A. That's my analysis of the Figure 3 in Uemura's patent. And that's how I render my opinion in the paragraph 132 to 133, and that's -- that's how I understand the data.

Q. (BY MR. COLIN) Okay. So based on your review of Figure 3 in Uemura, you believe that Uemura multiplied the molar amount of lithium by 180 milliamp-hours per gram to get his capacity values for the cathode; right?

A. That's correct.

MR. COLIN: Let's take a break.

THE VIDEOGRAPHER: On the record at 3:44 p.m.

(Recess from 3:44 p.m. to 4:00 p.m.)

THE VIDEOGRAPHER: The time is 4 p.m., and we're back on the record.

Q. (BY MR. COLIN) Dr. Yao, did you discuss the substance of your testimony with counsel during the break?

A. No, I didn't.

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Q. In paragraph 1 -- can you turn to paragraph 117 of your declaration. It's on page 55.
A. Yes, sir.
Q. Okay. You there?
A. Yes.
Q. In paragraph 117 you cite to Uemura at 81 for its disclosure that the charge-discharge was repeatedly performed at constant current of 0.5 milliamps per centimeter squared and a voltage ranging from 4.3 volts to 2.0 volts at an atmospheric temperature of 60 degrees Celsius; correct?
A. That's correct.
Q. You agree that Uemura teaches an applied voltage of 4.3 volts?
A. That's right.
Q. All right. And that's because Uemura discloses using constant current charging at .5 milliamps-hour per centimeter squared to a voltage of 4.3 volts; correct?
MR. STAMATOPOULOS: Object to

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form.
A. Yes, at high voltage of 4.3 volts.
Q. (BY MR. COLIN) Okay. So the maximum voltage to which Uemura is charged is 4.3 volts; correct?
MR. STAMATOPOULOS: Object to form.
A. I was going to say high voltage 4.3 volts. You know, it's not at equilibrium condition. So the battery voltage would be lower than 4.3 volt.
MR. COLIN: Can you please speak up a little bit? I think the court reporter might be having a little hard time hearing you.
THE WITNESS: Okay.
Q. (BY MR. COLIN) So if the board finds that the charge cut-off voltage is a charging voltage, Uemura discloses the charge cut-off voltage limitation; correct?
MR. STAMATOPOULOS: Object to form. Scope.
A. Are you asking a hypothetical question?

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Q. (BY MR. COLIN) Yeah. I'm asking you if the board finds that the charge cut-off voltage is a charging voltage, then Uemura discloses a charge cut-off limitation; correct?
MR. STAMATOPOULOS: Object to form.
A. I cannot answer the question with a hypothetical condition. This is not what the court find.
Q. (BY MR. COLIN) Dr. Yao, I'm asking you -- I'm allowed to ask you hypotheticals.
A. Okay.
Q. You cannot refuse to answer my questions.
A. Hm-hm.
Q. If the board finds that a charge cut-off voltage is a charging voltage, then Uemura discloses the charge cut-off limitation; correct?
MR. STAMATOPOULOS: Object to form. He hasn't, by the way, refused to answer your question. He answered your question. Just to be clear.
MR. COLIN: That is an improper

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speaking objection, Counsel.
MR. STAMATOPOULOS: Disagree with that. But proceed.
MR. COLIN: Counsel, it's inappropriate.
Q. (BY MR. COLIN) Dr. Yao, if the board finds that a charge cut-off voltage is a charging voltage, then Uemura discloses the charge cut-off limitation; correct?
MR. STAMATOPOULOS: Same objection.
A. I think the court has decided in the claim construction the charge cut-off voltage is a maximum voltage that batteries -- hold on. Let me -- sorry. I withdraw.
Q. (BY MR. COLIN) Dr. Yao, that is not my question. I'm not asking you about the court's claim construction.
My question is simply, if the board finds that an applied voltage is the charge cut-off voltage of the claims, then Uemura discloses the charge cut-off limitation; correct?

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MR. STAMATOPOULOS: Object to form.

A. I'm not available -- I'm not able to form opinion on this hypothetic question.

Q. (BY MR. COLIN) So sitting here today, you have no opinion on whether the disclosure of Uemura about charging up to 4.3 volts, if the board finds that an applied voltage is a charge cut-off voltage of the claims, you have no opinion whether that discloses it?

MR. STAMATOPOULOS: Object to form.

A. I'm not ready to form an opinion today as I sit here for this hypothetical question.

Q. (BY MR. COLIN) Dr. Yao, if the board finds that a POSITA would understand that constant current charging involves charging a battery at constant current until it reaches the charge cut-off voltage, then Uemura discloses the charge cut-off voltage limitation; correct?

MR. STAMATOPOULOS: Object to the form.

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A. So my deposition -- in my declaration, paragraph 199 -- 119, what I state here, because a battery Uemura was purpose -- purposely only charged with a constant current, and there was no constant voltage phase, the battery was not fully charged when the applied voltage reached 4.3 volts. In fact, the note page 64 had its own calculation as the current density of .5 milliamps per centimeter squared --

MR. COLIN: Dr. Yao, you're not answering my question. Move to strike as nonresponsive.

Q. (BY MR. COLIN) Dr. Yao, you under -- I'm asking you the question, if the board finds that a POSITA would understand that constant current charging involves charging a battery at constant current until it reaches the charge cut-off voltage, then Uemura discloses the charge cut-off voltage limitation; correct?

MR. STAMATOPOULOS: Object to the form. And I'll note, you interrupted his previous answer --

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MR. COLIN: Counsel, these objections are improper.

MR. STAMATOPOULOS: Putting it on the record that you've interrupted the witness --

MR. COLIN: You're impeding this deposition, Counsel. Do we need to bring this up with the board?

MR. STAMATOPOULOS: You can do as you see fit. You can do as you see fit. Now, if you want to restate your question, unless the witness remembers it.

MR. COLIN: Please stop with these improper objections, Counsel.

Q. (BY MR. COLIN) Dr. Yao, if the board finds that a POSITA would understand that constant current charging involves charging a battery at constant current until it reaches the charge cut-off voltage limitation, then Uemura discloses the charge cut-off limitation; correct?

MR. STAMATOPOULOS: Object to form.

A. You have a long -- if -- can you repeat

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if -- the whole sentence again? It's a little bit long for me.

Q. (BY MR. COLIN) Dr. Yao --

A. If you can write it down, it would be better.

Q. (BY MR. COLIN) -- let's go to Exhibit 2022 again, your own claim construction declaration. Let's go to paragraph 33.

A. Which --

Q. Exhibit 2022, your Apple claim construction declaration.

A. Okay.

Q. So I'll make this simple. You told the court --

A. Which paragraph?

Q. 33 -- "In many laboratory settings batteries are charged at a constant current without a constant voltage stage." You see that?

MR. STAMATOPOULOS: So where -- which line is that?

A. I see that, yes.

Q. (BY MR. COLIN) You continue, Dr. Yao,

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"Once the battery reaches a predetermined voltage -- i.e., the charge cut-off voltage -- the charging stops"; correct?

A. Correct.

Q. So if the board agrees with you in your declaration in paragraph 1 -- sorry -- 33 of the Apple IPR declaration that a POSITA would understand that constant current is applied until the battery reaches a predetermined voltage -- i.e., the charge cut-off voltage -- then the charging stops, Uemura discloses the charge cut-off limitation; correct?

MR. STAMATOPOULOS: Object to the form.

A. First, what you refer to is not Apple IPR. It's Apple claim construction. Second, in Uemura case, I have cited on the cover page, table contents, reasons A, B, and C. A is Uemura doesn't disclose the claim charge cut-off voltage limitation. B, Uemura doesn't disclose the claim result limitation. And C, Uemura is not an enabling reference.

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So even if in a hypothetical situation the court find what you proposed reasonable, just do other B and C, which with the prevented become valid.

Q. (BY MR. COLIN) So, Dr. Yao, if I understand that correctly, it's your testimony that if the board agrees with your opinions in paragraph 33 of Exhibit 2022 concerning constant current charging, Uemura discloses the charge cut-off limitation of the claims; correct?

MR. STAMATOPOULOS: Object to the form.

A. We need to look at the individual case. Constant current charging, if you are doing the very slow rate, the predetermined voltage would be the same as the charge cut-off voltage. But in this particular Uemura's case, as I've written and analyzed here in the page 56 and 57 in my declaration, note 64, it's with the last -- the charging would take three to four hours. It's relative medium charging current, not cut-off current still charging would charge battery at

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full capacity, using only current charging.

So in this particular condition we cannot consider that the -- that, you know, the voltage reaches charge cut-off voltage, even if the court find it reasonable.

Q. (BY MR. COLIN) You didn't tell the district of -- Central District of California that constant current charging may reach the charge cut-off voltage; correct? You said it's applied until it reaches the charge cut-off voltage; right?

MR. STAMATOPOULOS: Object to form.

A. We didn't specify the current condition. But, as I stated earlier, at that time the matter of dispute is always charging hourly. It's not the difference between applied voltage versus measured voltage.

Q. (BY MR. COLIN) So you're reading the court's claim construction to be the maximum voltage to which the battery is charged; correct? You require it to actually be charged to that

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voltage?

A. That's correct.

Q. So if Uemura had said with the charge constant current at C 50 to 4.3 volts, would that be the limitation under your understanding?

A. C over 50 means take 50 hour to charge, that's close to be equilibrium. I would consider that.

Q. Okay. If Uemura had indicated charging using constant current, constant voltage to 4.3 volts, would that mean the limitation under your understanding?

MR. STAMATOPOULOS: Object to the form. Scope.

A. Constant current and the constant voltage charging would be considered a measure to charge the battery to reach equilibrium. Yes.

Q. (BY MR. COLIN) If Uemura had said it was charged with a constant voltage to 4.3 volts, would that meet the limitation under your understanding?

MR. STAMATOPOULOS: Object to

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form.
A. During constant voltage charging, we also need to look at how much the cut-off current. You know. So in certain conditions, yes, it can reach equilibrium state when charging.
Q. (BY MR. COLIN) So it's your opinion to the board that Uemura actually needs to show an electrochemical measurement indicating it was fully charged to 4.3 volts to meet the limitation, under your understanding?
MR. STAMATOPOULOS: Object to form.
A. Yes, that's correct.
Q. (BY MR. COLIN) So in paragraph 120 of your IPR declaration -- are you there?
A. Yes.
Q. Okay. The third sentence you say, "While the current rate is one of the key factors, many other factors come into play, including electrode active material density, as particle size and distribution, conductivity of the electrode, the thickness of the electrode, the surface areas, the

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compositional electrolyte, temperature, and electrode porosity"; right?
A. Correct.
Q. So it's your understanding that a reference must disclose all that information to teach a charge cut-off voltage above 4.2 volts?
MR. STAMATOPOULOS: Object to form, scope.
A. In this paragraph -- Since the battery charge to 4.3 volt in order to determine if the battery has reached a charge cut-off voltage of higher than 4.2 volts, so the potential is about .1 volts. So in order to answer this question we need some more information in order to understand the similar equilibrium battery voltage.
Q. (BY MR. COLIN) The '641 patent doesn't describe any of those factors that you list out in paragraph 120 of your declaration; correct?
MR. STAMATOPOULOS: Object to form.
A. I was not asked to look into this particularly, other potential issues.

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Q. (BY MR. COLIN) So it's your opinion that, even though Uemura says the battery was repeatedly charged to 4.3 volts, Uemura's actual batteries were not fully charged to 4.3 volts?
MR. STAMATOPOULOS: Object to form.
A. That's correct.
Q. (BY MR. COLIN) So it's your opinion that the charging at constant current in Uemura stopped before it hit the 4.3 volt limitation?
MR. STAMATOPOULOS: Object to form.
MR. COLIN: Let me rephrase that.
Q. (BY MR. COLIN) It's your opinion that the charging at constant current in Uemura stopped before the battery was charged to 4.3 volts?
MR. STAMATOPOULOS: Object to form.
A. I -- after charging stops, I would believe that some equilibrium potential of the battery will be lower than 4.3 volts.
Q. (BY MR. COLIN) So it's your opinion that

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the charging at a constant current in Uemura stopped before the battery was charged at 4.3 volts; correct?
MR. STAMATOPOULOS: Object to form.
A. I didn't say "stopped." But if you measure open circuit voltage of the battery after charge stops, the voltage would be lower than 4.3 volt.
Q. (BY MR. COLIN) The claim construction doesn't require a open circuit voltage; right?
A. That's how I want to explain that what's equilibrium means.
Q. So it's your opinion that, under the court's claim construction, charge cut-off voltage, is that open circuit voltage?
MR. STAMATOPOULOS: Object to form.
A. You know, you have this claim construction. The charge cut-off voltage is the maximum voltage to which the battery is configured to be charged. So once you're fully charged, it's

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reach equilibrium.
Q. (BY MR. COLIN) But you're not applying "configured to be charged"; right? You're saying the battery must be charged to 4.3 volts; correct?
MR. STAMATOPOULOS: Object to form.
A. I don't know what's the difference.
Q. (BY MR. COLIN) You don't know what the difference between being configured to be charged versus actually charged is?
MR. STAMATOPOULOS: Object to the form.
A. My interpretation is "configured to be charged" means you're fully charged to reach equilibrium. You know, after you're charged, you may not reach equilibrium. You may or may not. Depends on your charging algorithms.
Q. (BY MR. COLIN) So, to be clear, you don't see any difference between a battery being configured to be charged to a voltage and a battery actually charged to a voltage?
MR. STAMATOPOULOS: Object to the

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form.
A. Well, we just use a charge cut-off voltage is the definition of this. So charge cut-off voltage is a battery property. So you measure the open circuit voltage of the battery at equilibrium. If it is 4.3 volt, it's 4.3 volt. With apply voltage at the 4.3 volt doesn't give you a battery with equilibrium potential for 4.3 volts.
MR. COLIN: That did not answer my question, Dr. Yao. Move to strike.
Q. (BY MR. COLIN) Dr. Yao, you don't see any difference between a battery being configured to be charged to a voltage and a battery actually charged to a voltage. Correct?
MR. STAMATOPOULOS: Object to form.
A. How do you define a battery actually charged to 4.3 volt? What -- what's your definition?
Q. (BY MR. COLIN) Dr. Yao, I'm asking for your opinions, because you've provided plenty of

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opinions on this. This is the construction. You're saying the battery must actually be charged. And the construction says it must be configured to be charged.
So I'm asking you, is it your opinion that a battery that must be configured to be charged to a voltage must be charged to that voltage?
MR. STAMATOPOULOS: Object to the form of the question.
A. It's different.
Q. (BY MR. COLIN) Dr. Yao, you relied on Dr. Liang's testing for your analysis in paragraph 123 and other paragraphs; correct?
A. That's correct.
Q. You never discussed the testing with Dr. Liang before he performed it?
MR. STAMATOPOULOS: Object to... I'm going to caution you not to disclose any privileged information. If you can answer without divulging privileged communications, please go ahead and do so.

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MR. COLIN: I'm not asking for any privileged information, Counsel. I'm just being very clear. The question is simply, did he have a discussion with Dr. Liang about the testing before Dr. Liang performed it.
MR. STAMATOPOULOS: So, again --
MR. COLIN: That's a "yes" or "no" question.
MR. STAMATOPOULOS: Okay. So you can answer "yes" or "no."
A. No, I didn't.
Q. (BY MR. COLIN) You never discussed the testing results with Dr. Liang before you submitted your declaration; correct? "Yes" or "no" question.
MR. STAMATOPOULOS: You can answer.
A. I've had one conversation with Dr. Liang in the presence of counsel.
Q. (BY MR. COLIN) Was that conversation before you submitted your IPR declaration or after you submitted your IPR declaration?

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A. Before I submitted my declaration.
Q. Okay. What did you discuss with Dr. Liang?
A. I'm not -- I'm not lawyer, and the conversation was with counsel. So I assume it's a privileged discussion.
MR. COLIN: Counsel, I'm happy to take a break on this. If he had a discussion with Dr. Liang -- I don't care if counsel was in the room -- that is a discoverable conversation, and I'm entitled to ask questions about it.
MR. STAMATOPOULOS: So I think --
MR. COLIN: We can take a break --
MR. STAMATOPOULOS: Well, let me put something on the record first. So I'm happy to take a break to discuss this with you, and then I'll discuss it with him. I think we may have different opinions on the issue. But I want to resolve it, and I want to move this along. So let's you and I talk first, and then I'll talk to him.

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MR. COLIN: Okay. Let's go off the record.
THE VIDEOGRAPHER: Off the record at 4:27 p.m.
(Recess from 4:27 p.m. to 4:40 p.m.)
THE VIDEOGRAPHER: The time is 4:40 p.m., and we're back on the record.
Q. (BY MR. COLIN) Dr. Yao, you testified today that before you submitted your IPR declaration, you had a conversation with Dr. Liang concerning his testing; correct?
A. I had discussion with Dr. Liang in the presence of counsel.
Q. What did you discuss with Dr. Liang?
MR. STAMATOPOULOS: And just to be clear because you earlier voiced a concern about privilege, you can answer "yes" or "no" if you remember what you discussed with Dr. Liang.
MR. COLIN: Counsel --
MR. STAMATOPOULOS: That's my --
MR. COLIN: -- that's not my question.

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MR. STAMATOPOULOS: My instruction is that you can answer "yes" or "no" -- first of all, if you want to ask that -- I don't want to have a dispute with you -- ask him if he recalls, and that's non- --
MR. COLIN: Counsel, I'm entitled to ask the questions I want. You could object or not. This is improper.
Q. (BY MR. COLIN) Dr. Yao, my question is, what did you discuss with Dr. Liang?
A. I don't remember what was discussed in the conversation.
Q. You don't recall anything that you discussed with Dr. Liang concerning his testing?
A. Yeah. It's a few months ago, and -- I remember I was traveling. So it's a very short, brief call and, you know, is not really much in my memory.
Q. So, sitting here today, you remember you had a conversation with Dr. Liang before you submitted your declaration; correct?
A. Yes.

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Q. You did not disclose to the board that you had a discussion with Dr. Liang concerning his testing; correct?
MR. STAMATOPOULOS: Object to form.
A. There was no requirement for me to disclose those.
Q. (BY MR. COLIN) So just to be clear, you did not indicate in your IPR declaration that you had any discussions with Dr. Liang concerning his testing; correct?
A. No, I didn't.
Q. So you're not -- you didn't rely on anything you discussed with Dr. Liang concerning his testing in your declaration?
A. No, I didn't. I rely on his -- the declaration document to form my opinion.
Q. Okay. So if information that you discussed with Dr. Liang was not disclosed in his declaration, you did not rely on it in providing your opinions here?
MR. STAMATOPOULOS: Object to the

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form. It's a bit of a double negative. Want to clear it up a little bit. I do want this to be a clear line of questioning.

A. Can you rephrase your question?

Q. (BY MR. COLIN) You did not rely on anything discussed with Dr. Liang that was not -- if it's not -- let me start again.

If something about Dr. Liang's testing is not in his declaration, it was not considered by you in providing your opinions here?

A. That's correct.

Q. So the only thing you relied on in providing your opinions on Dr. Liang's testing is his declaration; correct?

A. That's correct.

Q. You were Dr. Liang's postdoc advisor; correct?

A. I was, yes.

Q. You published multiple references with Dr. Liang as coauthors?

A. That's correct.

Q. You're co-inventors with Dr. Liang on a

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number of patents?

A. Correct.

Q. You're a cofounder of LiBeyond with Dr. Liang; correct?

A. Correct.

Q. Your company, LiBeyond, was contracted to do the testing that Dr. Liang performed for this proceeding; correct?

A. That's correct.

Q. Did the compensation LiBeyond received for that testing go to you partially?

A. No.

Q. How does the compensation received by LiBeyond get distributed between you and Dr. Liang?

A. I did not receive compensation from that revenue. Decide by CEO of the company.

Q. Who's the CEO of the company?

A. That's Matt Lee.

Q. Okay. So it's your testimony that any income received by LiBeyond is distributed based on the decisions of Matt Lee?

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A. As far as I know, the income is considered revenue. It's not distributed to anyone in the company.

Q. So as a co-owner of LiBeyond, you don't receive a proportion of any revenue?

A. At the end of physical year based on the -- I think it's not related to the -- I withdraw my statement.

Q. (BY MR. COLIN) Dr. Yao, I'm entitled to know if you received any compensation from Dr. Liang's testing. I'm simply asking, as a co-owner of LiBeyond, you receive a portion of revenue generated by the company in a given year; correct?

A. Yes.

Q. What's your ownership percentage of LiBeyond?

A. I'm not sure that's information I should -- I need to disclose.

MR. STAMATOPOULOS: Can we go on a brief break on this? Because I know there's a confidentiality issue, potentially. And, if so,

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I -- we can resolve it by designating this --

A. But I can -- under questioning, I didn't receive any compensation from this -- this expense.

Q. (BY MR. COLIN) Let me ask you this. So there would have been revenue generated by LiBeyond this year for the testing. So I understand you say you haven't received revenue yet. But at the end of the year, is the revenue divided up among the owners of the company?

A. So in the past several years, I would all expect this year would be at loss. That would be not -- that's no net profit of the company.

Q. Dr. Liang provided no controls for his testing; correct?

MR. STAMATOPOULOS: Object to form.

A. Can you be specific when you say "no control"?

Q. (BY MR. COLIN) Dr. Liang made no control cells; correct?

MR. STAMATOPOULOS: Same

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objection.
A. I provide -- I provide recipe with counsel. Counsel gave the recipe to Dr. Liang. In my recipe I didn't prescribe a control experiment.
Q. (BY MR. COLIN) Dr. Liang didn't make a single working cell; correct?
MR. STAMATOPOULOS: Object to form.
A. I think he did.
Q. (BY MR. COLIN) Where in his declaration did he provide a working cell?
A. Can you provide me the exhibit?
Q. Sure. Actually, where in your declaration do you indicate that Dr. Liang made a single working cell?
A. So in my declaration, paragraph 153, so I described "Dr. Liang successfully synthesized pure layered lithium .8 manganese .5 cobalt .5 O2 based on the ion-exchange method. He then tested the capacity of the synthesized cathode material at different voltage using lithium metal as the

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counter electrode, and the results was consistent with what is reported in the literature." So reference 105.
Q. Okay.
A. I think that's statement where I think he made working cells.
Q. That's using a different method than the method applied in Uemura; correct?
MR. STAMATOPOULOS: Object to form.
A. That's using ion exchange method. Yeah, it's different from Uemura disclosed. But that's the general method the literature has been reporting that has lead to successful synthesis of this layered manganese oxide material.
Q. (BY MR. COLIN) Dr. Yao, you don't note anywhere in your declaration how many times Dr. Liang tried to reproduce any of the examples of Uemura; correct?
MR. STAMATOPOULOS: Object to form.
A. Can you repeat your question?

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Q. (BY MR. COLIN) Dr. Yao, you don't know anywhere in your declaration how many times Dr. Liang tried to reproduce any of the examples of Uemura; correct?
MR. STAMATOPOULOS: Object to form.
A. I think I know how many times, you know, he tried. I said multiple attempts he tried in the paragraph 144.
Q. (BY MR. COLIN) So it's your understanding that Dr. Liang tried multiple times to create example 1 of Uemura?
MR. STAMATOPOULOS: Object. Form.
A. I think Dr. Liang tried to follow exactly the Uemura's since his conditions which I prescribed. He was not able to produce cathode materials and that he made some adjustment to synthesize electrolyte in air instead of in argon, which was taught to synthesize in Uemura's patent. And also he was not able to form the right phase of the lithium oxide. I think this is completely

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appropriate.
So this indicates that Uemura's method did not lead to the successful synthesis of the layered lithium oxide.
Q. (BY MR. COLIN) Dr. Yao, you understand that Dr. Liang tried to create example 1 of Uemura one time; correct?
MR. STAMATOPOULOS: Object to form.
A. Could you please give me his declaration form?
Q. (BY MR. COLIN) I'll give you the declaration. It doesn't state it. You can look. It's not in there. And I can tell you he testified that he only tried to create it once.
MR. STAMATOPOULOS: Is that a question?
MR. COLIN: That's not a question. That's a statement.
MR. STAMATOPOULOS: Do you think it's appropriate to be saying this to the witness?
MR. COLIN: Counsel, that's not

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an appropriate objection. I don't know what you're doing on the record, to be honest.
MR. STAMATOPOULOS: I don't think -- I don't think you have that one right, Jeff.
THE REPORTER: Do I mark this?
MR. COLIN: You don't need to. You can just give it to the witness. That's not the one I was looking for.
This is already marked as Exhibit 31. The Liang declaration.
Q. (BY MR. COLIN) My question, Dr. Yao, is you understand that Dr. Liang only tried to create example 1 of Uemura one time following the teachings of Uemura; correct?
MR. STAMATOPOULOS: Object to form.
A. Yes.
Q. (BY MR. COLIN) Dr. Yao, you understand that Dr. Liang only tried to create example 2 of Uemura one time following the teachings of Uemura; correct?

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A. That's true.
Q. Dr. Yao, you understand that Dr. Liang only tried to create example 3 of Uemura one time following the teachings of Uemura; correct?
A. Yes.
Q. So it's your testimony to the board that one failed attempt to make example 1 shows evidence of nonenablement of example 1?
MR. STAMATOPOULOS: Object to form.
A. Based on Dr. Liang's declaration, I believe Uemura's teaching of the synthesized material is wrong. No matter how many tries you make, if it's the wrong method, you will not be able to make a successful synthesis of the material no matter how many times you try.
Q. (BY MR. COLIN) Dr. Yao, one failed attempt at synthesizing a material shows evidence of nonenablement, in your opinion?
MR. STAMATOPOULOS: Object to form.
A. My opinion is -- is not the number of the

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times trial; it's the correctness of the procedure of synthesis. In the -- as I have pointed out in my declaration, there are many reports saying that I change method, as the desire method for synthesis layered manganese oxide material. And many people tried, you know, the similar method proposed by Uemura and does not lead to success synthesis. You can try a hundred times, I -- is hypothetical condition -- even try a hundred times, that would not able to lead to the success synthesis of this material.
Q. (BY MR. COLIN) So it's your opinion to the board that the data made up in Uemura, that the data in Figure 3 is just made up, it's just fake data?
MR. STAMATOPOULOS: Object to form.
A. So in paragraph 173, basically I state -- sorry. Paragraph one -- end of the paragraph 172, "A POSA with satisfactory results highly improbable, indeed impossible, and with the question whether data was would generate

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experimental data." In paragraph 173 in the end --
Q. (BY MR. COLIN) Let's stop there for a second, Dr. Yao. You testified earlier today that reviewing Figure 3, it's your understanding that the data for the capacity of the cathode ratio is calculated data; correct?
MR. STAMATOPOULOS: Object to form.
A. Can you -- can you repeat?
Q. (BY MR. COLIN) Yeah. You testified earlier today that, after reviewing Figure 3, that you believe that the data for the capacity of the cathode is calculated based on simply multiplying the molar ratio of lithium by 180; correct?
MR. STAMATOPOULOS: Object to form.
A. That's correct.
Q. (BY MR. COLIN) So under that understanding, there would be no errors in the capacity values, right, because they're calculated, in your opinion?

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MR. STAMATOPOULOS: Object to form.

A. I think Uemura is intent to present Figure 3 as experimental data.

Q. (BY MR. COLIN) Where does Uemura say the capacity data is experimental?

And I'll point you to page -- paragraph 130 of your declaration and specifically...

So in paragraph 130 you indicate, "On the calculated side, Uemura uses the total capacity of the cathode material to calculate the capacity balance which was allegedly experimentally determined," and you have footnote 77, which cites a Uemura at 81 and 102.

So I would like you to go to Uemura at paragraph 81 and show me where in Uemura he says the data is experimentally determined for the capacity.

A. On Uemura's patent -- Uemura's patent. So, you know, paragraph 74 to 79 basic describes the methods of fabrication of batteries. And paragraph 81 describe experimental transition.

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"The charge-discharge was repeatedly performed at a constant rate of .5 milliamp centimeters squared and a voltage ranging from 4.3 to 2.0 volt at an atmospheric temperature of 60 degrees C."

And the last sentence, "A result thereof is shown in Table 1 together with the other values."

So also in paragraph 102, "As apparent from the results shown in table of Figure 3, while the comparative example employing the lithium metal plate without total irreversible capacity negative electrode exhibits only 10 cycle of resistance, it was found out that the respective example of the present invention exhibit the cyclic resistance of roughly 10 to 35 cycles."

So table -- Figure 3 describes a lifetime, number of cycles of different examples. And they discuss how they made the battery, how they test the battery.

So this was leading to attribute E. This data presented here is experimental determined value.

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Q. (BY MR. COLIN) You're making that assumption based on the disclosures in Uemura. Uemura doesn't say that the capacity was actually measured; correct?

A. Well, the cycle life you cannot -- the cycle life must be an experimental measure. You cannot theoretically predict cycle life.

Q. I agree with you there, Doctor. But my question is simply, you're making an assumption based on those paragraphs in Uemura that the capacity is experimentally measured; correct?

MR. STAMATOPOULOS: Object to form.

A. Yeah, that's my assumption, correct, because that's, you know, if -- what's the point of making battery and testing without monitoring the battery data? So that's my assumption; it's experimental.

Q. (BY MR. COLIN) Well, the experimental actually described there, that's for the cycling; correct? As you said, that is experimental, and that's in Figure 1 -- or Figure 3; right?

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A. Yeah. But typically we present all experimental data in the same figure. You do not present some -- some as theoretical, some experimental.

Q. Let me ask you this. The '641 patented discloses cycling results, but it does not disclose theoretic capacity of the electrodes at 4.2 volts, correct, for any of the examples?

A. I think the, you know, '641 patent discuss, you know, theoretic capacity for 4.2 volt. In the first comment; right? So the practical capacity that you referred to is about one -- you know, something --

Q. (BY MR. COLIN) No, Dr. Yao, I'm asking you about the examples.

A. Examples. Okay.

Q. Right? The '641 patent, if you look at, for example, example 1, it gives you the capacity of the battery, and it gives you the capacity after 400 cycles. Right? It doesn't give you a measured capacity of the anode and a measured capacity of the cathode; correct?

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A. That's correct.
Q. If you turn to paragraph 125 of your declaration, you publish Figure 3 of Uemura; correct?
A. Correct.
Q. Okay. And Uemura discloses a capacity balance of the positive electrode to the negative electrode; correct?
A. That's correct.
Q. Okay. So, for example 1, Uemura reports a capacity ratio of 1 to 1.3; correct?
A. Yes.
Q. 1.3 falls within a range of 1 to 2.5; correct?
A. That's correct.
Q. 1.5 falls within the range of 1 to 2.5?
A. That's correct.
Q. 1.1 to 1 falls within the range of 1 to 2.5; correct?
A. That's correct.
Q. So all of the examples in Figure 3 of Uemura provide a capacity balance that falls

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within a range of 1 to 2.5; correct?
MR. STAMATOPOULOS: Object to form.
A. The ratio is correct, but the whole they calculate is wrong.
Q. (BY MR. COLIN) Okay. I understand your position. But if the board finds that the capacity ratio limitation is not limited to theoretic capacity, the examples of Uemura disclose the claimed capacity ratio; correct?
MR. STAMATOPOULOS: Object to the form.
A. Can you repeat the question?
Q. (BY MR. COLIN) If the board finds that the capacity ratio limitation is not limited to theoretic capacity, the examples of Uemura disclose the claimed capacity ratio; correct?
MR. STAMATOPOULOS: Object to the form.
A. Those are not correct. In the paragraph 179, page 71, so Uemura calculates the capacity balance use anode capacity that include inactive

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material. So inactive material should now be used, according to claim construction.
Q. (BY MR. COLIN) You believe that inactive material has a capacity?
MR. STAMATOPOULOS: Object to form.
A. As I stated in the paragraph 114, according to Uemura, the irreversible capacity of anode material is directly proportional to the noncarbon content. The more impure the anode material is, the more reversible capacity the anode material has. So, in other words, according to Uemura, the sole purpose of alleged noncarbon content was to create irreversible capacity.
Q. (BY MR. COLIN) Uemura specifically describes the use of complex oxide or nitrides as negative electrode material; correct?
A. I think Uemura was using hydrocarbon with noncarbon content as anode material.
Q. If you turn to paragraph 29 of Uemura --
A. Yes.
Q. -- Uemura explicitly teaches the negative

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electrode material described above is not limited to carbon material but various complex oxide or nitride can also be used. When these materials are employed as a negative electrode material, it is recommended to use negative electrode material -- and it goes on.
Uemura discloses the use of complex oxide or nitrides in paragraphs 29 and paragraphs 53 as active material; correct?
A. In paragraph 30 in the same patent it also state, "It should be noted that, in the case where a carbon material is employed as negative electrode material of the rechargeable lithium battery, the irreversible capacity..."
So in addition to the oxide nitride you mentioned, the carbon material is also used as a negative electrode --
Q. Right. But doesn't Uemura disclose the use of complex oxide or nitrides to increase the irreversible capacity of the electrode because the lithium plates to it?
MR. STAMATOPOULOS: Object to

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form.
A. To my understanding, there's no good oxide in the nitride anode negative electrode materials. I think the majorities in negative electrode material discussed in this Uemura's patent is carbon materials.
Q. (BY MR. COLIN) So you didn't just -- you didn't provide any opinions on the fact that Uemura discloses complex oxides or nitrides that can actually affect intercalation to increase the reversible capacity of the electrode?
MR. STAMATOPOULOS: Object to form.
A. In the paragraph 91 to 98, all examples 9 to 16, they all use carbon as a negative electrode. I think I didn't provide my opinion using nitride and oxide as anode material.
Q. (BY MR. COLIN) So you're focusing only on the examples which have the very low irreversible capacity?
A. Well, I was only look at that page. So...

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Q. You provide no opinions in your declaration concerning Uemura's disclosure of the use of complex oxides or nitrides; right? That's just not in your declaration?
A. That's correct.
Q. Okay. In paragraph 126 of your declaration, you cite to paragraph 33 of Uemura; correct?
A. 126?
Q. 126.
A. That's correct.
Q. Okay. Uemura indicates in paragraph 33 that the capacity ratio should be fixed at a range of 1 to 1.5 anode to cathode; correct?
MR. STAMATOPOULOS: Object to form.
A. It said, "the total capacity B of the negative electrode material to the total capacity A of the positive electrode material." So, you know, positive and negative sometimes can be -- you know, be used as cathode anode, but cathode anode is less strict compared to positive and

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negative.
Q. (BY MR. COLIN) Okay. So, to be clear, paragraph 33 of Uemura discloses a ratio of positive electrode material -- of negative electrode material to positive electrode material of 1 to 1.5; correct?
A. That's correct.
Q. Okay. A range of 1 to 1.5 falls within a range of 1 to 2.5; correct?
A. That's correct.
Q. Paragraph 33 just refers to capacity; correct?
MR. STAMATOPOULOS: Object to form.
MR. COLIN: Let me rephrase.
Q. (BY MR. COLIN) Paragraph 33 doesn't refer to theoretic capacity; right?
A. It's not clear to me what "capacity" refers to.
Q. Dr. Yao, paragraph 33 doesn't mention "theoretic capacity"; right?
A. Yes, it didn't.

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Q. Paragraph 33 doesn't mention "practical specific capacity"; right?
A. No. It talk about capacity.
Q. Right. So it's your opinion that discussion of capacity within a range of 1 to 1.5 does not anticipate or render obvious the claimed range; correct?
A. That's correct.
Q. In paragraph 127, you indicate that you consider paragraph 33 of Uemura and Figure 3 to be one and the same; correct?
MR. STAMATOPOULOS: Object to form.
A. Can you repeat the last few words in the sentence -- question?
Q. (BY MR. COLIN) You state -- you refer to paragraph 33 of Uemura, then you refer to Figure 3 of Uemura, and you state, "I, therefore, consider the two aspects of Uemura one and the same"; correct?
MR. STAMATOPOULOS: Object to form.

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A. That's correct.
Q. (BY MR. COLIN) So you believe that disclosed range of capacities and specific embodiments should be treated as one and the same for an invalidity analysis?
MR. STAMATOPOULOS: Object to form.
A. Repeat the last two sentence -- two words?
Q. (BY MR. COLIN) Yeah. You treat a disclosed capacity range and specific embodiments as one and the same for your invalidity analysis; correct?
MR. STAMATOPOULOS: Object to form.
A. I don't know those.
Q. (BY MR. COLIN) Can you repeat that?
A. I do not know that. I do not have answer to your question.
Q. Well, you state in 127, you told the board that you considered the two aspects of Uemura one and the same; correct? Those words are

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there?
A. Yes.
Q. Sitting here today, you have no opinion on whether you treated a disclosed range and specific embodiments as one and the same for your analysis?
MR. STAMATOPOULOS: Object to form.
A. That's not the question you asked earlier. Can you ask the same question? I think it's different.
Q. (BY MR. COLIN) Dr. Yao, sitting here today, you have no opinion on whether you treated the disclosed range in paragraph 33 and the specific embodiments in Figure 3 as one and the same in your analysis?
MR. STAMATOPOULOS: Same objection.
A. I state there are the two aspects of Uemura one and the same.
Q. (BY MR. COLIN) Okay.
A. That's correct.

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Q. You provide no analysis that paragraph 33 of Uemura is not enabled in your declaration; correct?
MR. STAMATOPOULOS: Object to form.
A. Can you repeat?
Q. (BY MR. COLIN) You provide no analysis in your declaration that paragraph 33 of Uemura is not enabled in your declaration; correct?
MR. STAMATOPOULOS: Same objection.
A. I think I provide analysis to support --
Q. (BY MR. COLIN) Well, I understand --
A. -- paragraph 33 is incorrect.
Q. -- that you provided analysis about the cathode materials. I understand that. That's clearly within your declaration. I'm asking you a very specific question. I have not seen it in here.
You provide no analysis in your declaration that paragraph 33 of Uemura, which just discloses a claim capacity ratio, is not

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enabled; correct?
MR. STAMATOPOULOS: Object to the form.
A. I provide analysis in my declaration, 142 paragraph. I said -- stated, "As shown in the table below, if the correct capacities are used to calculate the claimed ratio of the '641 patent, all of the examples have ratios falling outside the claimed range, as shown in the yellow highlight column. In other words, all" --
Q. (BY MR. COLIN) That paragraph is directed to Figure 3, Dr. Yao; right? I'm not trying to be difficult here, but I'm asking a very specific question. You had --
A. That's my analysis.
Q. On Figure 3. Correct?
A. Yes.
Q. You don't provide the opinion in your declaration that paragraph 33 of Uemura is not enabled; correct? You simple apply your analysis that the cathode materials of Figure 3 are not enabled; correct?

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MR. STAMATOPOULOS: Object to form.
A. No, I didn't provide opinion on this.
Q. (BY MR. COLIN) Prior to his testing for this case, Dr. Liang never tried making materials similar -- similar to those in Uemura; correct?
MR. STAMATOPOULOS: Object to form.
A. I'm not sure.
Q. (BY MR. COLIN) That's not something you considered in relying on it, in your declaration; correct?
A. That's correct.
Q. Okay. Dr. Liang provided no pictures of his experiments to support his declaration; correct?
MR. STAMATOPOULOS: Object to the form.
A. All I rely on is his report. I didn't see pictures.
Q. (BY MR. COLIN) Dr. Liang didn't provide the actual data to you prior to you submitting

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your declaration; correct?
A. Can you repeat?
Q. Dr. Liang didn't provide the actual data, which was not included in his report, prior to you submitting your declaration; correct?
A. So you're referring to raw data -- I referring raw data for the data testers?
Q. Yeah, the actual machine data that came out, which was produced after Dr. Liang's deposition, that's not something that you relied on in considering his declaration; correct?
A. He didn't provide, but that's no reason to doubt the -- the accuracy of his data.
Q. If you turn to paragraph 144 of your declaration.
MR. STAMATOPOULOS: Jeff, question. Do you have a lot more on this line? I don't want to cut you off. Just wondering if it's a good time to take a break.
MR. COLIN: We could take a break if you want.
MR. STAMATOPOULOS: Okay.

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THE VIDEOGRAPHER: Off the record at 5:34 p.m.
(Recess from 5:34 p.m. to 5:43 p.m.)
THE VIDEOGRAPHER: The time is 5:43 p.m., and we're back on the record.
Q. (BY MR. COLIN) Turning to paragraph 144 of your IPR declaration, you don't provide an opinion on how much experimentation is undue experimentation in your declaration; correct?
MR. STAMATOPOULOS: Object to form.
A. In this paragraph I state he make "multiple attempts and further improvements," he make some adjustment, for example, in the annealing condition in the air. But he was still not able to reproduce the secondary lithium ion battery with a performance process described by Uemura. So I'm not sure what "undue experiment" really means.
Q. (BY MR. COLIN) Right. And I'm just confirming -- I understand Dr. Liang made one attempt using Uemura's procedures and one attempt

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using his alleged further improvement. But you don't provide any opinion specifically on how much testing is required to be undue experimentation; correct?
MR. STAMATOPOULOS: Object to form.
A. You are correct.
Q. (BY MR. COLIN) In paragraph 147, you don't provide any basis for your statement that examples 1 to 4 are representative of the cathode active materials in examples 5 to 17; correct?
A. Actually, that's not true. In fact, I provide the explanation in the same paragraph. Here is what I stated. So "example 1 to 5 -- 1 to 4 purposely have the best cycle life of among all 17 examples. Further, example 2 is representative of all examples in Uemura as it contains both alleged innovative aspects of Uemura, namely that example 2 purports to use a lithium deficient cobalt doped lithium manganese oxide as the cathode active material and also use an anode material with more irreversible capacity than

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conventional anode materials."
So "Accordingly, a POSA would reasonably expect that when trying to reproduce the example in Uemura, those examples, which is cathode material in example 1 to 4 and example 2 battery, should have the best chance of being reproduced."
So that's the reason --
Q. So the only reason why you say examples 1 to 4 are representative of the other examples are because they allegedly had the best cycle life?
MR. STAMATOPOULOS: Object to form.
A. That's one of the reason. There's other reasons I just described.
Q. (BY MR. COLIN) The other reasons for talking about example 2 of the anode material; correct?
A. It's a combination of the cathode and, you know, anode material --
Q. Dr. Yao, examples 1 to 9 were made by a coprecipitation method; right?
A. Can you repeat?

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Q. Examples 1 to 9 of Uemura were made by a coprecipitation method, as described in Uemura at paragraph 69 to 71?
MR. STAMATOPOULOS: Can we go off the record for a second?
MR. COLIN: There's no basis to go off the record when there's a question pending, Counsel.
MR. STAMATOPOULOS: This has nothing to do with this question. This has something to do with -- I -- I need -- I need to resolve -- I have a dispute with you. And I can put it on the record; I can put it off the record. We can wait for him to answer your question. But we're going to need to do this promptly.
MR. COLIN: This is inappropriate, Counsel.
MR. STAMATOPOULOS: Please answer the question, and afterwards I'll ask that we go on the record. You can repeat your question.
Q. (BY MR. COLIN) Dr. Yao, examples 1 to 9 of Uemura were made by a coprecipitation method as described in Uemura at paragraphs 69 to 71; correct?
A. That's correct.
Q. (BY MR. COLIN) Examples 10 to 17 were made by --
MR. STAMATOPOULOS: Jeff --
Q. (BY MR. COLIN) -- use of a solid phase mixing method, correct, as described in paragraphs 69 and 72 to 73?
MR. STAMATOPOULOS: Objection to form.
A. That's correct.
Q. (BY MR. COLIN) You provide no analysis regarding those two different fabrication methods in your declaration; correct?
MR. STAMATOPOULOS: Object to form.
A. In the paragraph 148 in my declaration I basically state that "Uemura disclose -- disclose all three cathode materials in example 1 through 4 were prepared according to a coprecipitation method described at paragraph 71." And that's all

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the same method -- recipe I prescribed to counsel; so instruct totally on two -- two sentences.
Q. (BY MR. COLIN) Dr. Yao, that didn't answer my question. My question was simply, you provide no analysis regarding the two different synthesis methods of examples 1 to 9 and examples 10 to 17 of Uemura; correct?
MR. STAMATOPOULOS: Object to form.
A. Because I only instruct Dr. Liang to synthesize examples 1 to 4; so, you are right, I didn't provide a comparative analysis on these two methods.
MR. COLIN: Let's take a break.
THE VIDEOGRAPHER: Off the record at 5:51 p.m.
(Recess from 5:51 p.m. to 5:53 p.m.)
THE VIDEOGRAPHER: The time is 5:53 p.m., and we're back on the record.
Q. (BY MR. COLIN) Dr. Yao, you indicated that the anode of example 2 is representative of the anode of all the other examples in Uemura;

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correct?
MR. STAMATOPOULOS: Object to form.
Q. (BY MR. COLIN) That's in paragraph 147.
A. This statement here, anode materials, example 2, has more irreversible capacity. I think this -- you know, according to the patent this would have the highest cycle life. I'm not saying that is representative of all examples in Figure 3. Because clearly --
Q. Dr. Yao, you say specifically in paragraph 147, "Example 2 is representative of all examples in Uemura"; correct?
A. Yes.
Q. Example 2 has an anode with a total irreversible capacity of .44; correct?
A. .44 milliamp-hour.
Q. There's multiple examples which use an anode that has very little irreversible capacity, .002; correct?
A. That's correct.
Q. You provide no analysis about how the

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anode of example 2 is representative of the anode of example 5, 6, 7; correct?
MR. STAMATOPOULOS: Object to form.
A. Well, I did do some analysis. In Figure 3, example 2 has a number of cycle life 430 -- 330 cycles. That's one of the highest -- one of the highest cycle life. So those with lower irreversibility, about .002 milliamp-hour, has a relatively lower cycle life. So that's why I say that in the handout paragraph 147, "a POSA would reasonably respect when trying to reproduce the example in Uemura, those examples -- example 2, for example -- should have the best chance of being reproduced."
So because the -- my instruction to Dr. Liang cannot repeat every single example in this table; so we will pick the one that has the best chance of being reproduced.
Q. (BY MR. COLIN) Dr. Yao, my question --
MR. COLIN: Move to strike as nonresponsive.

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Q. My question is simply, you provided no analysis about how the anode of example 2, which has a relatively high irreversible capacity as you put it, more than the conventional anode, is representative of anodes that have extremely low irreversible capacity such as the anode of example 9; correct? That analysis is not in your report?
MR. STAMATOPOULOS: Object to form.
A. I did an analysis because the claim of the Uemura patent is saying higher irreversible is better for cycle life. So that's why there's no reason we need to perform that type of analysis.
Q. (BY MR. COLIN) So you think you could just ignore the embodiments of Uemura that have an extremely low irreversible capacity in the anode?
A. We didn't explore --
MR. STAMATOPOULOS: Object to -- Sorry. Let me put in my objection. Object to form. You can answer.
A. Can you repeat your question?
Q. (BY MR. COLIN) To me you still haven't

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answered my question. My question was simply, you provide no analysis in your declaration about how an example with the anode material which you quote, say is more irreversible capacity than conventional anode materials, is representative of anodes that have been precycled to have an extremely low irreversible capacity; correct? That analysis is not in your declaration.
MR. STAMATOPOULOS: Object to form.
A. So your question is a long and negative statement. Can you rephrase in the positive statement?
Q. (BY MR. COLIN) Dr. Yao, in paragraph 147 you state example 2 is representative of all examples in Uemura; correct?
A. That's right.
Q. My question is simply, you provide no analysis showing that the anode of example 2, which you indicate is a higher irreversible capacity than conventional anode materials, is representative of an anode that is precycled to

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have an extremely low irreversible capacity such as the anode in example 9 and 10; correct?
MR. STAMATOPOULOS: Object to form.
A. Although I didn't present the analytical -- analytics in my declaration, you know, I can tell you now that...
Q. (BY MR. COLIN) Dr. Yao, that's -- you've already answered my question. I don't -- if you want testify about other stuff, your counsel can redirect you.
Dr. Yao, you provided no analysis in your declaration comparing the procedures used by Dr. Liang -- let me restate that.
You don't indicate anywhere in your declaration where the procedures used by Dr. Liang differed from the conditions described by Uemura; correct?
MR. STAMATOPOULOS: Object to form.
A. Can you repeat?
Q. (BY MR. COLIN) You don't indicate

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anywhere in your declaration where Dr. Liang used procedures of synthesizing the examples of Uemura where he used different conditions than those described by Uemura; correct?
MR. STAMATOPOULOS: Same objection.
A. So in paragraph 150 of my declaration, Dr. Liang modify the synthesis process and annealed the mixture in the air of 500 degrees C for five hours and then 900 degrees C for 12 hours."
Q. Dr. Yao, I understand that --
A. So -- so --
Q. -- Dr. Liang did his own modifications --
A. Yeah.
Q. -- to Uemura as a second experiment. But for his first experiment where he tried to recreate Uemura, all I'm asking you is, you don't indicate anywhere in your declaration where Dr. Liang used procedures of synthesizing the examples where he used different conditions than those described by Uemura; correct?

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MR. STAMATOPOULOS: Object to form.
A. I was trying to answer your question. In the paragraph 150 is different, the condition, as Uemura's condition. So that's my comment in paragraph 151. I say, "The failed attempts by Dr. Liang are not surprising." That's my, you know, opinion. That, you know, failure is not that surprising because, blah, blah, blah. Because what I show here in the paragraph 151. So if I understand your question correctly. So your question is pretty hard to understand.
Q. (BY MR. COLIN) Dr. Liang indicates he tried to replicate Uemura's teachings; right? That's one of his experiments?
A. That he was instructed to duplicate.
Q. Okay. And for his experiment where he tried to duplicate Uemura, you don't indicate anywhere in your declaration when he used procedures that did not duplicate Uemura; correct?
MR. STAMATOPOULOS: Object to form.

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A. Can you repeat the question?
Q. (BY MR. COLIN) You provide no analysis on the fact that Dr. Liang used a five-hour pre-annealing step that is not described in Uemura; correct?
MR. STAMATOPOULOS: Object to form.
A. I see in paragraph 149 I have put my -- put my opinion on the result Dr. Liang followed and the result he accomplished is consistent with the literature. So I'm not surprised --
Q. You provide no analysis on the fact that Dr. Liang failed to apply a pressure of two tons per centimeter squared as Uemura taught; right?
A. Where do you find that?
Q. You provide no analysis in your declaration on the fact that Dr. Liang used electrode with different diameter than Uemura; correct?
MR. STAMATOPOULOS: Object to form.
A. Those details would not lead to

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reasonable doubt of the accuracy of his results.
Q. (BY MR. COLIN) You provide no analysis on the fact that Dr. Liang used a molybdenum electrode which is different from Uemura; correct?
MR. STAMATOPOULOS: Object to form.
A. The electrode used, it was not make any change of the result accomplished.
Q. (BY MR. COLIN) You provide no analysis of the fact that Dr. Liang used a different electrolyte than Uemura; correct?
MR. STAMATOPOULOS: Object to form.
A. I think the electrolyte similar in both cases.
Q. (BY MR. COLIN) Dr. Liang, you provide no analysis in your report on the fact that Dr. Liang used a different separator than Uemura; correct?
MR. STAMATOPOULOS: Object to form.
A. Different separator -- separator used would not lead to the different behavior of the

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cathode material which is the focus on this patent.
Q. (BY MR. COLIN) You provide no analysis in your declaration on the fact that Dr. Liang used a different current from Uemura; correct?
MR. STAMATOPOULOS: Same objection.
A. Can you repeat?
Q. You provide no analysis in your declaration on the fact that Dr. Liang used a different current from Uemura?
MR. STAMATOPOULOS: Same objection.
A. What do you mean, current from --
Q. Currents.
A. Currents. I was instruct him to as slow as possible, which typically would give you higher levels of capacity compared of higher rate.
Q. (BY MR. COLIN) You provide no analysis of the fact in your declaration that Dr. Liang used a different loading than Uemura; correct?
MR. STAMATOPOULOS: Object to

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form.
A. I'm not sure that's a -- that's right statement in term of loading.
Q. (BY MR. COLIN) There's no analysis of it in your declaration to look at; correct?
MR. STAMATOPOULOS: Object to form.
A. Those difference would not materially change the conclusion.
Q. (BY MR. COLIN) You're telling the board that different loading on the electrode doesn't have a material effect?
MR. STAMATOPOULOS: Object to form.
A. That's the low rate. That's what I instructed to do.
Q. (BY MR. COLIN) Dr. Liang never performed any chemical analysis to determine whether his compositions actually contain the proper amount of lithium; correct?
MR. STAMATOPOULOS: Object to form.

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A. I think that statement is not true. Dr. Liang in his report indicate isometry of lithium in the compound he synthesized, which was .8. I think that's close to what Uemura's patent --
Q. (BY MR. COLIN) So you're opining here that Dr. Liang actually did chemical analysis to determine whether his composition actually contained the proper amount of lithium?
A. That's what he stated in his statement.
Q. Okay. Dr. Liang -- Dr. Yao, in paragraph 149, you talk about literature at the time. My question is for you, did you perform a literature search to see what publications were out there on layered lithium manganese oxide?
A. That's correct.
Q. So you performed the search yourself?
A. Yes.
Q. And how long did you spend on it?
A. Well, that's a few months ago. I don't think I remember how much -- how many -- how many hours.

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Q. So you can't provide me any range of time for how long you spent on the literature search concerning layered lithium manganese oxide?
A. Maybe, you know, two to three hours.
Q. Turning to paragraph 188 of your declaration. For reference, I'll give you example 1005 -- Exhibit 1005, which is the Abe reference. We're looking at paragraph 188 of your declaration, sir.
So you quote a portion of paragraph 78 in paragraph 188; correct?
A. That's correct.
Q. And so if you turn to paragraph 78 of Abe, which is Exhibit 1005 -- and keep out your declaration because we're going to be doing a little comparison. Okay.
So you left out in your black quote the very first sentence of paragraph 78, correct, which is "in a nonaqueous electrolyte-based secondary battery according to the present invention, the designed capacity of the negative electrode is adjusted so that the design capacity

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of the negative electrode is greater than the design capacity of the cathode"; correct?
A. That's not include in the declaration.
Q. In your quote. Right. And then if you turn to page 98 of your declaration, that same paragraph, 188, in the middle there's a set of ellipses, right, where you see the four dots?
A. Hm-hm.
Q. So you cut out a portion of the paragraph there, correct, and you put it in ellipses?
A. Yes.
Q. Okay. So if we turn to paragraph 78 of Abe, the portion you left out is "The predetermined voltage is 0 volts at the vapor-phase-grown carbon fiber negative electrode"; correct? You left that out of your quote on paragraph 188?
A. Yes.
Q. Okay. Who choose to cut out that portion of paragraph 78?
MR. STAMATOPOULOS: Object to form.

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A. So this was -- this part is in collaboration with counsel.
Q. (BY MR. COLIN) Okay.
A. So I assume it's counsel.
Q. Okay. So you provide no opinion in your declaration on that portion of paragraph 78 that you cut out; correct?
MR. STAMATOPOULOS: Object to form.
A. Let me read the whole paragraph. Can you repeat your question.
Q. (BY MR. COLIN) I said, in your declaration you provide no opinion on that portion of paragraph 78 that you cut out of the quote and put in ellipses; correct?
MR. STAMATOPOULOS: Object to form.
A. I do provide my opinion on paragraph 193 and 194 and -- yeah, to 197. So that's about graphite anode material, which is very similar to Abe's graphite of vapor-phase-growth carbon. So --

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Q. (BY MR. COLIN) Dr. Yao, those paragraphs that you just pointed me to -- 193, 194, and 197 -- are not directed to that portion of paragraph 78 that you left out of your declaration; correct?
MR. STAMATOPOULOS: Object to form.
A. Is related, right? Because on paragraph 193, clear say Abe's graphite vapor-grows -- you know, vapor-phase-grown carbon; right? So the typical half-cell body of the anode material is about .1 to .2 volt.
Q. (BY MR. COLIN) Dr. Yao, in paragraph 193 you're talking about paragraphs 99 and 102; you're not talking about paragraph 78. Correct?
MR. STAMATOPOULOS: Object to form.
A. So you are asking the emission -- you know, you're asking about predetermined voltage of zero volt as the vapor-phase-grown carbon fiber negative electrode. All right. So what is shown here on the paragraph 193 is Abe's graphitized

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vapor growth -- vapor-phase-grown carbon. So that's the same object we are referring to.

Q. (BY MR. COLIN) Dr. Yao, you are not answering my question. In paragraph 193 you're simply referring to paragraphs 99 and 102 of Abe; correct? You provide no opinion in paragraph 193 concerning the portion of Abe that you intentionally left out of seven -- paragraph 78?

MR. STAMATOPOULOS: Object to the form of the questions.

A. It can also refer to the paragraph 78. I do not see why it cannot.

Q. (BY MR. COLIN) Dr. Yao, I'll ask you one more time because you're refusing to answer my question. You provide no opinions in your declaration concerning that language of paragraph 78 of Abe that you intentionally struck with ellipses; correct?

MR. STAMATOPOULOS: Object to the form of the question.

A. I don't understand your question. Can you repeat?

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Q. (BY MR. COLIN) Dr. Yao, you provide no opinions in your declaration concerning the language of paragraph 78 of Abe that you intentionally struck with ellipses; correct?

MR. STAMATOPOULOS: Same objection.

A. As written in the paragraph 193, my opinion of the graphitized vapor-phase-grown carbon described here in paragraph 78, the half-cell voltage is .1 to .2 volt. That's my opinion.

Q. (BY MR. COLIN) You can't point anywhere in your declaration sitting here today where you discuss the language of paragraph 78 of Abe that you intentionally struck out with ellipses; correct?

MR. STAMATOPOULOS: Object to form.

A. The same anode material described in paragraph 193 in my declaration as well same as paragraph 78 in Abe's patent.

Q. (BY MR. COLIN) So it's correct that,

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sitting here today, you can't point to anywhere in your declaration where you discuss the language of paragraph 78 of Abe that you intentionally struck out with ellipses; correct?

MR. STAMATOPOULOS: Object to form.

A. We didn't have that. That's why we didn't talk about that. I don't know what's the question you're trying to ask.

Q. (BY MR. COLIN) Paragraph 18 of Abe doesn't indicate a certain voltage; correct?

MR. STAMATOPOULOS: Object to form.

A. Can you repeat?

Q. (BY MR. COLIN) Sure. So in paragraph 18 Abe discloses "a nonaqueous electrolyte-based secondary battery according to" -- and in parentheses 4 -- "having a design capacity of more than 1 and less than or equal to 1.6 for the design capacity of the positive electrode described in 4." Correct?

MR. STAMATOPOULOS: Object to

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form.

A. Which parts? I did not find it.

Q. (BY MR. COLIN) So it's on page 19 of 31 and right in the middle.

A. Okay.

MR. STAMATOPOULOS: Which line, approximately?

MR. COLIN: There's no line numbers. It's right in the middle of the page.

MR. STAMATOPOULOS: Okay.

Q. (BY MR. COLIN) So it says number 4, "having a design capacity of more than 1 and less than or equal to 1.6 for the design capacity of the positive electrode"; correct?

MR. STAMATOPOULOS: Object to form.

A. That's what it says in this patent.

Q. (BY MR. COLIN) Right. In this paragraph where it's talking about the capac- -- secondary battery should have a designed capacity of more than 1 and less than or equal to 1.6 for the design capacity of the positive electrode, doesn't

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indicate a specific voltage for that capacity ratio; correct?
MR. STAMATOPOULOS: Object to form.
A. Can you repeat your question?
Q. (BY MR. COLIN) Right. In paragraph 18 where Abe discloses that the battery should have a design capacity of more than 1 and less than or equal to 1.6 for the design capacity of the positive electrode, it does not disclose that that capacity ratio should be determined at any particular voltage; correct?
MR. STAMATOPOULOS: Object to form.
A. That's correct.
Q. (BY MR. COLIN) It's your opinion that using 4.2 volts for determining a capacity ratio is something that a POSA would do?
MR. STAMATOPOULOS: Object to form.
A. Do? Sorry. Do what?
Q. (BY MR. COLIN) Let me restate. It's

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your opinion that it's conventional to use a charge cut-off voltage of 4.2 volts to determine a capacity ratio; correct?
MR. STAMATOPOULOS: Object to form.
A. That's correct.
MR. COLIN: Let's take a break.
THE VIDEOGRAPHER: Off the record at 6:32 p.m.
(Recess from 6:33 p.m. to 6:41 p.m.)
THE VIDEOGRAPHER: The time is 6:41 p.m. We're back on the record.
MR. COLIN: I'll pass the witness.
MR. STAMATOPOULOS: All right. We're going to take 15 minutes, and I'll have some limited redirect, I think. But we'll be back in 15. Is that okay?
MR. COLIN: Okay.
MR. STAMATOPOULOS: All right. Great.
THE VIDEOGRAPHER: Off the record

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at 6:42 p.m.
(Recess from 6:42 p.m. to 6:53 p.m.)
THE VIDEOGRAPHER: The time is 6:53 p.m. We're back on the record.
EXAMINATION
BY MR. STAMATOPOULOS:
Q. Welcome back, Dr. Yao. Just have a few questions.
Now, do you recall you were asked by counsel a number of questions as to whether you did or did not provide opinions in your declaration about a number of issues in this IPR?
MR. COLIN: Objection to form.
A. Yes, I recall.
Q. (BY MR. STAMATOPOULOS) Sir, have you memorized your declaration?
A. No, I didn't. It's a long declaration.
Q. You tried, to the best of your ability, to remember whether you provided opinions on certain issues or not; right, sir?
MR. COLIN: Objection to form. Leading.

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A. Yes, I tried my best.
Q. (BY MR. STAMATOPOULOS) Dr. Yao, you were asked by counsel if the '641 patent provided details as to how to conduct its cycling test. Do you recall that?
A. Yes.
Q. Do you recall if you provided opinions in this IPR concerning this issue?
MR. COLIN: Objection to form.
A. Yeah, in this IPR -- IPR declaration in paragraph 59 I offered my opinion how '641 patent tackle the charge cut-off voltage and the capacity ratio in tandem.
Q. (BY MR. STAMATOPOULOS) You said paragraph 59?
A. 59. And how the -- what the charge cut-off voltage, how the -- wait. Also how do the -- how the inventors addressed anode cathode capacity ratio and how they addressed charge cut-off ratio so they could safely exceed 4.2 volt without substantial performance loss. So that's already to how battery was fabricated and how they

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are charged for cycling.
Q. Does paragraph 59 describe in detail how to conduct the '641 patent's -- let me withdraw that question.
Does paragraph 59 contain specific citations to the '641 patent portions that describe in detail how to conduct the '641 patent cycling tests?
MR. COLIN: Objection to form.
A. Can you repeat your question?
Q. (BY MR. STAMATOPOULOS) Does paragraph 59 of your declaration contain specific citations to the '641 patent portions that describe in detail how to conduct the '641 patent cycling tests?
MR. COLIN: Objection to form.
A. No, it didn't.
Q. (BY MR. STAMATOPOULOS) Now, you've provided a declaration in the parallel Apple litigation; correct?
A. That's correct.
Q. Can I invite your attention to your second declaration in that litigation marked

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Exhibit 1036 in this deposition.
A. Yes.
Q. Can I invite your attention to paragraph 15, page 8, of that declaration. I'll invite you to spend a moment to read that paragraph and familiarize yourself.
A. Which paragraph?
Q. 15.
A. Okay.
MR. COLIN: Objection. Leading and outside the scope.
Q. (BY MR. STAMATOPOULOS) Does that refresh your recollection, Dr. Yao, as to whether you've formed opinions about the '641 patent's descriptions of its cycling tests?
MR. COLIN: Objection. Leading and outside the scope.
And outside the scope of his declaration.
A. Yes. This Apple claim construction Exhibit 1036 in the paragraph 15, I do state my opinion that the POSA reading '641 patent would

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understand that the charge and discharge conditions for the cycling tests would not be outside the normal operating condition for commercial device of general applicability.
So the testing details could be used standard, normal operating conditions for '641 patent.
Q. (BY MR. STAMATOPOULOS) Does paragraph 15 contain citations to the '641 patent?
MR. COLIN: Objection. Leading.
A. Yes. Multiple citations in this paragraph. In paragraph 15, "The '641 patent explains how to prepare the cathode, the anode, and how to build a battery with the key components." That's '641 patent, column 9:61 to 10:25.
"'641 patent also provides the claim capacity ratio of the positive electrode material to the negative electrode material and the charge cut-off voltage" in column 10:29 to 15:54.
Also, "The '641 patent is clear that the invention is focused on commercial batteries for

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generally applicable uses" in column 1:19 to 28, column 1:64 to 67, column 4:43 to 53, column 7:1 to 8; column 9:45 to 48; column 16:45 to 51.
And then I also state that, "Finally, the patent states that, except voltage, all process parameters for charge and discharge are commonly used in the art." In -- yeah, paragraph 9:22 to 23.
So this -- basically, that's a detail -- I think that's, you know, the detail charge and discharge parameters typical for use in '641 patent.
Q. (BY MR. STAMATOPOULOS) Do you recall during your direct examination being asked by counsel as to whether you were a person of ordinary skill in the art at the time of -- as of the priority date of the '641 patent?
A. Yes.
Q. You were not a person of ordinary skill in the art as of the priority date; correct?
A. That's correct.
Q. Given that you were not a person of

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ordinary skill in the art as of the priority date, how would you know what the understanding of a person of ordinary skill in the art would be with respect to concepts at issue in this IPR as of the priority date?

MR. COLIN: Objection to form.

A. Lithium ion batteries was commercial in 1991. Some -- some thing -- some basic principle and terminology would not change in the last several years.

Q. (BY MR. STAMATOPOULOS) Now, Dr. Yao, you mentioned in your direct examination in response to certain questions by counsel the concept of equilibrium. Do you recall that?

A. Yes.

Q. What is equilibrium, briefly?

MR. COLIN: Objection to form.

A. Equilibrium means it's in a stable state that doesn't change. The voltage doesn't change anymore.

Q. (BY MR. STAMATOPOULOS) Now, if a person of ordinary skill in the art were using constant

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current and constant voltage to fully charge a battery with a 4.2 volt cut-off voltage, would it be necessary to measure the voltage at equilibrium to determine the battery voltage at equilibrium?

MR. COLIN: Objection to form and outside the scope.

A. If you use a CC/CV measure to fully charge the battery, it's not necessary to measure again because it already reach the equilibrium at the fully charged state.

Q. (BY MR. STAMATOPOULOS) And if a person of ordinary skill in the art were using very slow constant current to fully charge a battery with a 4.2 volt cut-off voltage, would it be necessary to measure the voltage at equilibrium to determine the battery voltage at equilibrium?

MR. COLIN: Objection to form. Outside the scope.

A. If they do it very slowly with constant current charging method to fully charge the battery, the battery would be at equilibrium at the end of the charge, and it is not necessary to

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measure the voltage.

Q. (BY MR. STAMATOPOULOS) Is it necessary to measure the voltage if the battery is charged with a constant current algorithm at a fast rate in order to determine the battery voltage at the end of charging?

MR. COLIN: Objection to form.

A. Yes.

Q. (BY MR. STAMATOPOULOS) Why is that?

A. If you use a faster current, it most likely did not fully charge -- the battery is not fully charged. And so you have to do the measurement.

Q. Do you recall being asked by counsel questions about whether it would be necessary for a POSA to do measurements to determine battery voltage as well as about a disclosure in the patent that the voltage is set to a particular value?

MR. COLIN: Objection to form. Compound.

A. Yes.

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Q. (BY MR. STAMATOPOULOS) Does the disclosure in the '641 patent about the charge cut-off voltage being set change your views or opinions one way or the other?

MR. COLIN: Objection to form and outside the scope.

A. Can you repeat?

Q. (BY MR. STAMATOPOULOS) Sure. Does the use of the word "set" in the '641 patent change your views or opinions one way or the other?

MR. COLIN: Objection to form. Leading.

A. Change my previous opinion?

Q. (BY MR. STAMATOPOULOS) Change your opinion as to whether the charge cut-off voltage is a battery property.

MR. COLIN: Objection to form. Leading.

A. No, it doesn't.

Q. (BY MR. STAMATOPOULOS) Why not?

A. Charge cut-off voltage, as I state in my declaration, is a battery property. What is set?

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It supply the voltage. Doesn't matter how you change. It still does not change charge cut-off voltage.

Q. Do you recall being asked by counsel whether you provided analysis as to a statement in your declaration that Uemura example 2 was representative of other examples in Uemura?

MR. COLIN: Objection to form.

A. Yes.

Q. (BY MR. STAMATOPOULOS) And you were asked questions about a number of different -- such differences, including about the separator, the electrolyte, the pressure applied by Dr. Liang. Do you recall that?

MR. COLIN: Object to form. Misstates.

A. Yes.

Q. (BY MR. STAMATOPOULOS) Not trying to create an exhaustive list, but you recall being asked various questions about various differences. Fair?

MR. COLIN: Objection to form.

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A. Yes.

Q. (BY MR. STAMATOPOULOS) Now, Dr. Yao, were you aware of these differences at the time you formed the opinions in your declaration?

MR. COLIN: Objection. Form. Outside the scope of the declaration.

A. Yes, I'm aware of those differences when I prepared the declaration.

Q. (BY MR. STAMATOPOULOS) Did these differences affect your opinions in any way?

MR. COLIN: Objection to form. Scope.

A. Not, it would not change my opinion as shown here. Those difference are small enough would not change -- materially change the conclusion.

Q. (BY MR. STAMATOPOULOS) What's your basis for saying that these differences are small enough that they wouldn't change your conclusions?

MR. COLIN: Objection to form, scope.

A. You know, base my -- I work on lithium

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batteries, you know, last 13 years. I have taught this lithium battery class to hundreds of students. Those inactive, other than separators, you know, current (unintelligible) are not -- do not play a critical role in the electrochemical reactions. Therefore, I draw the conclusion that the small difference would not materially change the results and conclusion from the experiments.

MR. STAMATOPOULOS: Thank you, Dr. Yao. I don't have any further questions at this time. I'll pass the witness.

EXAMINATION

BY MR. COLIN:

Q. Dr. Yao, you did not rely on Exhibit 1036 in providing your opinions in this IPR; correct?

A. 1036?

Q. Correct. That's not cited anywhere in your declaration?

A. I think you're correct.

MR. COLIN: No further questions.

THE VIDEOGRAPHER: Anything else?

MR. STAMATOPOULOS: No further

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questions. Sorry.

MR. COLIN: Thank you for your time today, Dr. Yao.

THE VIDEOGRAPHER: We are off the record at 7:10 p.m.

(Deposition concluded at 7:10 p.m.)

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CERTIFICATE OF SHORTHAND REPORTER

I, Mark Tod Kislingbury, Certified Reporter and Notary Public within and for the State of Texas do hereby certify: That YAN YAO, PHD, the witness whose deposition is hereinbefore set forth, was duly sworn by me before the commencement of such deposition and that such deposition was taken before me and is a true record of the testimony given by such witness.

I further certify that the adverse party, RJ Technology, LLC, was represented by counsel at the deposition.

I further certify that the deposition of YAN YAO, PHD, occurred on August 8, 2024, commencing at 9:49 A.M. CT to 7:10 P.M. CT.

I further certify that I am not related to any of the parties to this action by blood or marriage, I am not employed by or an attorney to any of the parties to this action, and that I am in no way interested, financially or otherwise, in the outcome of this matter.

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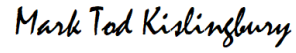
Certified to by me this 11th day of August, 2024.



Mark Tod Kislingbury, Texas CSR 298
Expiration Date: 2/28/26
Firm Registration No. 686
451 Hungerford Drive
Suite 400
Rockville, MD 20850
Phone: 888.433.3767
Fax: 888.503.3767

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